THE

RAILWAY GAZETTE

Price: Two Shillings

FRIDAY, FEBRUARY 22, 1957

Annually £4-10s. by post

UNIVERSITY FEB 27 1957 LIBRARY

ENGINEERING

MAR 5 1957

DIESEL SHUNTING LOCOMOTIVES

The above illustration shows one of the diesel shunting locomotives recently constructed by the Yorkshire Engine Company Ltd., Sheffield.

These locomotives are in service in many industrial works throughout the country and many of them are equipped with Timken tapered-roller-bearing axleboxes.

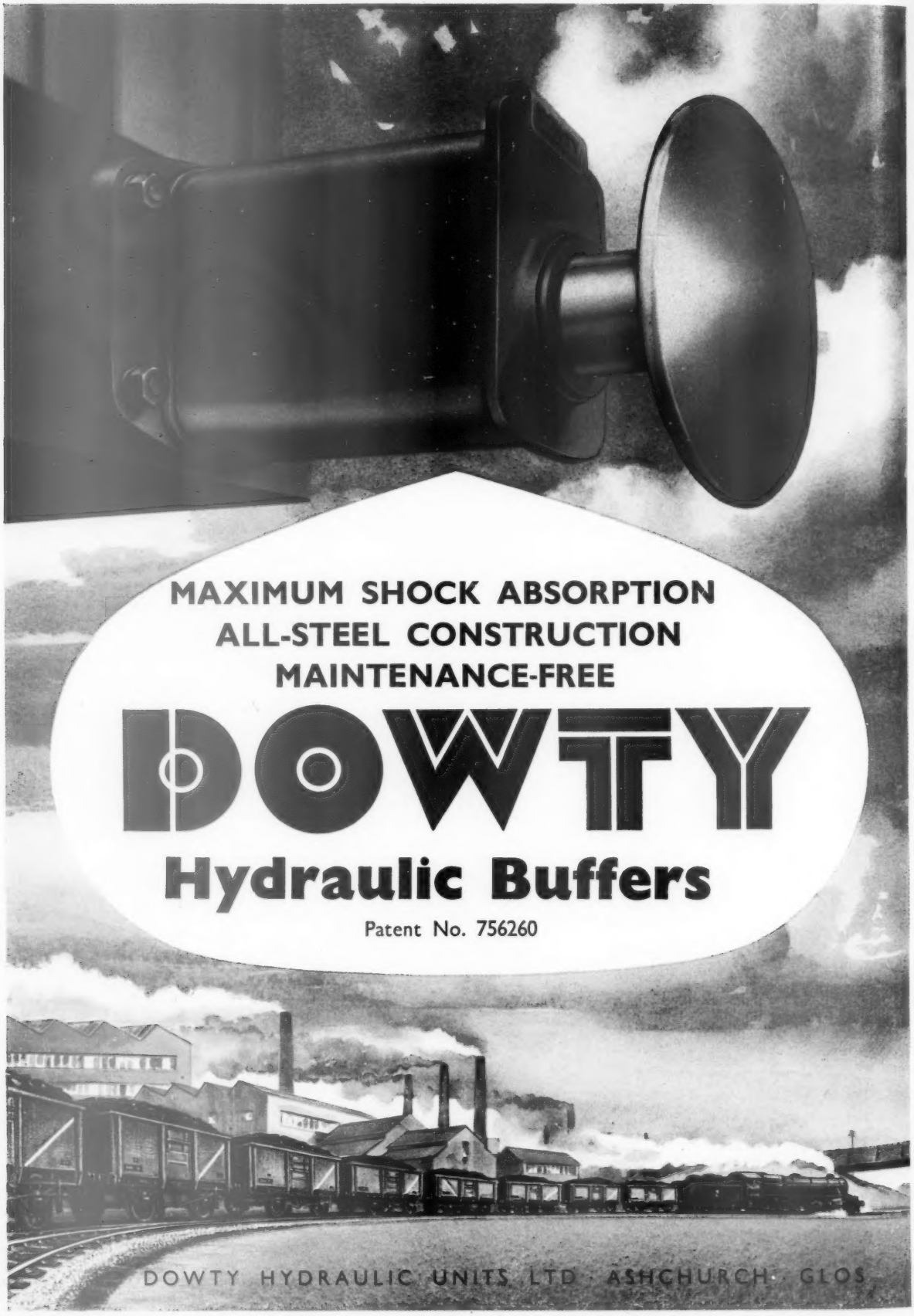
TIMKEN

Regd. Trade Mark: TIMKEN

tapered-roller-bearing axleboxes

MADE IN ENGLAND BY BRITISH TIMKEN LTD.

DUSTON, NORTHAMPTON (HEAD OFFICE); DAVENTRY AND BIRMINGHAM


MAXIMUM SHOCK ABSORPTION
ALL-STEEL CONSTRUCTION
MAINTENANCE-FREE
DOWTY
Hydraulic Buffers
Patent No. 756260
DOWTY HYDRAULIC UNITS LTD · ASHCHURCH · GLOS

THE RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer · TRANSPORT · The Railway News
The Railway Times · Herapath's Railway Journal ESTABLISHED 1835 · THE RAILWAY RECORD.
RAILWAYS ILLUSTRATED · THE RAILWAY OFFICIAL GAZETTE

33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1.
Telephone : WHItehall 9233 (12 lines) *Telegrams : "Trazette Parl, London"*
BRANCH OFFICES
GLASGOW: 87, Union Street . . . . . *Central 4646*
NEWCASTLE-ON-TYNE: 21, Mosley Street . . *Newcastle-on-Tyne 22239*
MANCHESTER: Century Insurance Building, St. Peter's Square *Central 3101*
BIRMINGHAM: 90, Hagley Road, Edgbaston . . . *Edgbaston 2466*
LEEDS: 70, Albion Street . . . . . *Leeds 27174*
BRISTOL: 8, Upper Berkeley Place, Clifton . . . . . *Bristol 21930*
Annually £4 10s. by post. Single copies, Two shillings.
Registered at the G.P.O. as a newspaper. Entered as second-class matter in U.S.A.
Editor: B. W. C. Cooke, Assoc. Inst. T.

Vol. 106] FRIDAY, FEBRUARY 8, 1957 [No. 6

CONTENTS

	PAGE
Editorial Notes	149
George Jackson Churchward	151
Railway Freight Rates	151
Trans-Zambesia Railway	152
Nyasaland Railways Limited	153
Development of Road Transport in India	153
Letters to the Editor	154
The Scrap Heap	155
Overseas Railway Affairs	156
Track Loading Fundamentals—3	157
British Railways Prototype Coaches	161
London Transport De-Icing Experiments	164
Personal	165
News Articles	169
New Equipment and Processes	170
Contracts and Tenders	172
Notes and News	174
Railway Stock Market and Official Notices	176

Diesel Locomotive Exports

THE news that India has placed orders for 100 2,000-h.p. diesel-electric locomotives with Alco Products Incorporated of New York draws attention once more to the strides being made by North American builders in supplying markets once regarded as traditionally British. Only last week we reported the placing of an order by Argentina, once another traditionally British preserve, with the Montreal Locomotive Works Limited, an Alco associate, for 25 1,800-h.p. diesel-electric "World" locomotives. The failure of British locomotive-builders to secure these orders is attributable, in a large part, to factors outside their control. One of these is the immense influence, both direct and indirect, of financial aid from the U.S.A. or from international organisations in which U.S.A. influence is decisive. The other main factor is the large internal market for diesel locomotives which exists in North America. This has enabled the principal builders to establish production lines from which an extra 100 locomotives can be turned out with little further preparation; which, in turn, has made possible early deliveries and competitive prices—considerations of great importance to overseas buyers. The whole of the Argentina order will be completed in the first half of this year and the first 20 locomotives for India will leave in June. British manufacturers, who, until the diesel programme of British Railways is well under way, still lack any extensive home market, cannot compete with this. Yet another factor is the success of U.S.A. builders in persuading railway administrations to accept what is virtually a standard locomotive. The American General Electric company has had successes in the Philippines, Chile, Argentina, and Brazil. General Motors is supplying locomotives to Canada, Egypt, Iran, Indonesia, and some South American countries. British builders, however, have not been idle. Apart from the prototypes on order for British Railways, in the last few weeks English Electric has had a repeat order from Rhodesia for 12 2,000-h.p. diesel-electrics and an order from the Midland Railway of Western Australia for seven 750-h.p. diesel-electrics. Hudswell, Clarke has an order for Sierra Leone. Nevertheless, the need for a home market is apparent. Given that, a case might then be made out for building fewer types of locomotives of wider application, with close co-operation between manufacturers catering for the export trade.

London Fares

IT has been suggested that London Transport is making considerable economies in bus services as a result of freer running in the London streets, from which petrol rationing has cleared many of the usual parked motorcars. That there have been great improvements in bus operation is apparent to anyone using the buses regularly, and this was confirmed by Sir John Elliot, Chairman of London Transport, in London last Friday. A report of his remarks appears on another page. The opportunity to reduce fares, however, is more apparent than real. London Transport has incurred an extra fuel bill of £40,000 a week through increased prices, and the overall reduction of 5 per cent in services is unevenly distributed because full services are being maintained at peak hours. This causes unbalanced workings which are uneconomic. The extra halfpenny added to the 2½d. fare does not quite cover the increased costs and the running of full-length trains on the underground lines throughout the day is costing some £10,000 extra each week. There have also been increases in busmen's wages and London Transport railwaymen are claiming increases. The extra halfpenny fare will be removed when fuel rationing ends. Sir John Elliot confirms that there are no plans for London fare increases at present, but can hold out no assurance that when the extra halfpenny is removed it will not have to be re-imposed to pay for wages.

Hidden Subsidy for Airlines

THE recent special report of the Select Committee on Estimates, criticising the increasing amount of public money lost on the operation of aerodromes in the United Kingdom, shows that an indirect subsidy is being given to airline operators. The committee believes that, taking account of operating loss, administrative costs away from airports, depreciation, and interest on capital, the loss in the financial year 1955-56 was some £7,000,000. It finds it "incomprehensible" that Mr. Harold Watkinson, Minister of Transport & Civil Aviation, has not been prepared to take more energetic measures to increase revenue. It was hoped that, as air traffic increased, the losses would be reduced, but in fact losses have grown with the traffic. The operating loss alone represents a subsidy of some 8s. a passenger and the committee, remarking that it sees no reason why air travel should be in such a favoured position compared with other means of transport, including railways, recommends that air fares should be increased on a sliding scale, dependent on the length of flight, to offset this. Mr. Watkinson has now stated that he hopes before long to announce a scheme for increased landing fees. He has been waiting for the conclusion of the International Conference on Airport Charges.

French National Railways Record Year

GREAT economic activity in France and neighbouring countries and the operating and commercial efficiency of the French National Railways resulted in their carrying more traffic in 1956 than ever before. Passenger traffic was up by 6·8 per cent with a total of 29,700 million passenger-km. against 27,800 million in 1955. The number of passengers carried was 520 million compared with 509 million in 1955. The increase in freight traffic was 7·5 per cent, with 50,300 million *tonne*-km. against 46,800 million in the preceding year. The total tonnage transported was 206 million, compared with 191 million *tonnes* in 1955. This record traffic was handled with less staff (363,500 against 368,700 in 1955). The number of locomotives fell likewise from 11,600 in 1955 to 11,000 and freight vehicles from 383,000 to 376,000. The improvement in efficiency is further shown by a reduction of 3 per cent in the total consumption of coal, fuel oil and electric current per km.-unit of traffic and an increase of 10 per cent in the output of the staff.

Heavier Railway Traffics

THE figures issued earlier this week by the Ministry of Transport & Civil Aviation showing that British Railways last week carried between 8 and 9 per cent more general merchandise than in the corresponding week of 1956, more than 3 per cent more of mineral products other than coal, some 20 per cent more passengers, and 14 per cent more parcels, are not unexpected in the light of the fuel oil shortage ; nor is the announcement that they are moving about 70,000 tons of coal that would formerly have gone by road. The further details, however, to be issued in due course, are needed before an accurate assessment can be made of the success of these movements from the operating point of view. Equally hard to assess is the report by London Transport that a comparison of the same period shows an increase of 8 per cent in the number of passengers travelling by Underground and 6 per cent by bus and motorcoach. British Railways and London Transport seem to be carrying the additional traffic with relative ease.

Trade Exhibition of Vacuum Brake Requirements

PROVISION of components to make possible the execution of British Railways plans to fit wagons with the vacuum brake will mean heavy demands on industry this year, as the carrying out of the programme gathers momentum, and from 1958 onwards will entail fitting about 800,000 vehicles. The British Transport Commission states that it may require much greater capacity than can be provided by firms normally engaged on contracts for work of this kind. The Commission has, therefore, decided to widen the field of its enquiries, and has arranged an exhibition in Euston Station on February 18-22 and February 25-March 1 of the components which will be required ; the majority of these are steel, with a few steel and iron castings, and one or two light alloy and rubber components, for firms who may be interested. Drawings and specifications will be on view. The exhibition is being arranged solely for manufacturers' representatives and will not be open to the general public. Details are given on another page.

Work Study Techniques

THE confirmation by Sir Brian Robertson, Chairman of the British Transport Commission, of his belief in work study, particularly as applied to permanent way work, will be welcomed widely as indicating the Commission intention to use the most modern techniques available in relation to its labour force as well as in modernising its equipment. Speaking at the recent Permanent Way Institution conversazione, he pointed out that work study would enable men working on the line to earn higher pay. This is because work study techniques provide bases for incentive schemes of payment by results. At the same time, rationalisation enables more work to be done—and often better work—in shorter hours. Not least of the benefits is the spirit of progress imbued in the men concerned. Sir Brian Robertson is known, in his own words, to be "very keen" on the application of work study to railway duties where this is practicable, and there can be little doubt that once its advantages are realised, the staff will be equally keen. Permanent way work is a particularly promising field for work study, but no doubt plans are in hand for its wide extension.

Irish Pioneer Work in Diesel Traction

THE first showing in Northern Ireland of the Shell-Mex & B.P. Limited instructional film, "The Diesel on Rail," was the occasion of Mr. G. W. Todd, Manager of the National Sales Department of the firm, emphasising the pioneer rôle of Irish railways in the application of diesel traction. The first instance of a diesel railcar in regular service in the British Isles was on the 3-ft. gauge County Donegal Railways in September, 1931, using Gardner engines. Since the last war the Great Northern of Ireland and Coras Iompair Eireann have led the way in the development of multiple-unit main-line passenger services, and now C.I.E. is the first major railway undertaking in these islands to embark on relatively extensive working of both passenger and freight trains with diesel locomotives. Only a few years ago the Ulster Transport Authority was the first in Britain to turn over to diesel traction exclusively an intensive suburban service—that over the former Belfast & County Down Railway between Belfast and Bangor. All these ventures have been successful in spheres in which, after careful consideration, they were deemed to be suited for the particular conditions prevailing. Brief reference to the film was made in our issues of November 9 and 23, 1956.

Innovations in British Railways Stock

THERE are several features of interest in the design of the British Railways first and second class prototype coaches recently completed by the Metropolitan-Cammell Carriage & Wagon Co. Ltd., which have been on view for the first time at Marylebone Station. It has been left to the discretion of the builders of the prototype stock to formulate their own individual designs, subject to the proviso that the basic dimensions conform to British Railways standard ; other builders of prototype stock will include the Gloucester Railway Carriage & Wagon Co. Ltd., the Birmingham Railway Carriage & Wagon Co. Ltd., and Cravens Limited, and six are also being built at the Eastern Region Carriage & Wagon Works, Doncaster. In the Metropolitan-Cammell stock double-glazed windows—uncommon in this country—will not only ensure more equable interior temperature, but increase sound insulation and act as a demister. Decorative panels in plastic form the walls above the seats on either side ; these being incorporated in the Formica veneers. The first class coach contains a ladies powder room. Ashtrays are fitted in the seat arms, a welcome innovation, which will make for increased cleanliness. The coaches are described and illustrated elsewhere in this issue.

Rectifier Systems for Rolling Stock

FIRST details issued by the English Electric Co. Ltd. of the 112 motor coach equipments for the Fenchurch Street-Southend 50-cycle electrification (see our January 18 and 25 issues) gives an interesting sidelight on the characteristics of mercury-arc and semi-conductor rectifiers. A high overall efficiency is claimed for the mercury-arc rectifier operating at 1,350 V., as in this instance. This has been borne out by a recent study of both types, in which it was concluded that at present the mercury-arc may well be superior in efficiency to semi-conductors at such voltages, where the four motors of a motor coach may be connected in two parallel groups of two motors in series, enabling four rectifiers to provide full-wave rectification. This method will be used in the Southend trains and is similar to the power scheme of the English Electric equip-

ments which have been operating on the Lancaster-Morecambe-Heysham line since 1952. On the other hand the output from the mercury-arc rectifiers in the successful S.N.C.F. Bo-Bo 50-cycle locomotives, which are ignitrons like those of the Southend stock, is a nominal 750 V. and eight units supply the four motors in parallel. The English Electric rectifiers will be air-cooled, as with germanium traction rectifiers. The latter are particularly suitable for outputs in the 500-V.—700-V. region, because of their low voltage drop, but here they may soon meet a challenge from new mercury-arc devices in which the arc drop has been reduced below the average present value of just over 20 V.

Stepping Up

THE question of steps on coaches on railways overseas for use at stations where no platforms, or only low platforms, exist, has engaged attention for years. That the problem is not solved by providing high-level platforms when the same stock serves stations with platforms at different levels is shown in South Africa. Delegates of the National Council of Women have represented to senior officers of South African Railways & Harbours—and demonstrated during a journey—that women have difficulty in getting on and off the 3-ft. 6-in. gauge trains at high-level platforms because of the wide gap between the edge of the platform and the coach steps, and that the position is also difficult at places where low-level, or no platforms at all, exist. The technical difficulties such as those caused by the limitations of the moving structure gauge in relation to platforms of varying heights were appreciated by the deputation. These difficulties exist in many other countries; it would be interesting to know if any solution has been found—other than the use at low platforms of portable steps, as in North America.

George Jackson Churchward

FEW men achieve the distinction of being commemorated on the centenary of their birth, for the lapse of time from the conclusion of their active career is too short to permit of an accurate evaluation of their achievements. There can be no doubt, however, of the propriety of marking the centenary of the birth, on January 31, of George Jackson Churchward, Chief Mechanical Engineer of the Great Western Railway and probably the most progressive locomotive engineer of his time, a period when steam locomotive design approached its zenith. Indeed, this claim was made by Sir William Stanier in a paper which he read as recently as October, 1955.

Churchward was born in Devonshire and was articled to the Locomotive Superintendent of the South Devon Railway at Newton Abbot. He was transferred to Swindon upon the amalgamation of that railway with the G.W.R. in 1876 and thereafter his life was linked intimately with both Swindon works and town. He became Locomotive, Carriage & Wagon Superintendent of the G.W.R. in June, 1902 (a position retitled the Chief Mechanical Engineer in 1916), and reigned until his retirement at the end of 1921. He was a pioneer in the standardisation of parts, and the use of high boiler pressure, top feed, and the Swindon superheater, as well as long-stroke cylinders with long valve travel, and his four-cylinder 4-6-0 express engines were world-famous in their day.

As a townsman of Swindon, Churchward was equally energetic. Upon the establishment of the New Swindon Urban District Council in 1894 he was elected a member of the Board and became Chairman in 1897, and was the first Chairman of the Technical Education Committee which was set up in 1898. When the Borough was incorporated in 1900, Churchward became the first Mayor of Swindon, and his valuable services to the town were eventually marked by his creation as the first Honorary Freeman of Swindon in October, 1920. Upon his retirement from railway service, he requested that the bulk of the testimonial fund raised in his honour should be handed over in trust for the provision of annual grants to apprentices and junior clerks who distinguished themselves in their studies. He was still living in one of the G.W.R. houses at Swindon until his death on December 19, 1933, in tragic circumstances, when he was knocked down by the down Fishguard express outside the grounds of his house, while crossing the line to the works in foggy weather. The centenary of his birth was marked by the laying of a wreath on his grave at Christ Church, Swindon, in a ceremony briefly recorded elsewhere in this issue.

Railway Freight Rates

IN the present interim stage of railway charging practice the clear and comprehensive survey of the merchandise charges scheme for British Railways presented by Mr. J. R. Pike, Chief Commercial Officer, British Railways Division, British Transport Commission, to the Federation of Railway Lecture & Debating Societies (North Eastern Region) at York recently is particularly valuable. Mr. Pike was the Commercial Witness for the Commission at the public hearing of the scheme before the Transport Tribunal. The paper, which had been read previously to the Western Region (London) Lecture & Debating Society, was given on December 5, 1956, before the confirmation of the British Transport Commission (Railway Merchandise) Charges Scheme by the Transport Tribunal, but most of Mr. Pike's observations, based on the interim decision of the Tribunal last July, have lost nothing of their force.

He shows that a great deal of work had been done on the charges schemes which the Commission was required by the Transport Act of 1947 to submit for the approval of the Transport Tribunal when the requirements were materially varied by the Act of 1953. These changes entailed almost a fresh start, so that it was not until March, 1955, that a scheme could be submitted for examination. This draft scheme was described in our issue of March 25, 1955. The scheme has been said to represent the greatest change that has occurred in the history of railway charges.

Discussing the reasons for a departure from the present system of standard charges, he recalls that transport requires both a facility—a way on which to move—and a mode of carriage, which he describes as a service. The first approaches to transport regarded these two components as separate, but when it became apparent that the railways, in their very nature, would have to provide both the way and the means of movement on it, there was for the first time a partial combination of the two elements. Even so, privately-owned wagons remained in extensive use until recent times. Following the example of canals, railways charged tolls for the use of the way and additional and separate tolls for the use of motive power and wagons. Although these were later consolidated, charges for terminal services and facilities were left unregulated until the 1888 Act, which codified for the first time the distinction between conveyance and terminals. The form of charges continued to follow precedent, the level being varied according to the presumed ability of the traffic to pay. Commodities were distinguished by a classification denoting the class and thus the maximum charges applicable. The principle established was that railway freight charges were determined by the value of the service to the user rather than by the cost of the service to the provider. The level of charges had to be such as would collectively produce sufficient revenue to remunerate the undertaker adequately. The charge combined the formerly separate elements of way and carriage and was expressed, in principle, in a form which distinguished between conveyance on the one hand and terminal services and facilities on the other. There were also obligations to afford equal treatment to users in the same circumstances and not to give undue preference, and also to keep rates open to inspection.

The Railways Act, 1921, made little change in fundamental principles. Value remained the predominant factor, but the former eight classes were subdivided into 21. The railways were free to make exceptional rates,

subject to the approval of the Transport Tribunal when they were more than 40 per cent below the standard charge, but they could not be cancelled or increased without notice in a form to be prescribed by the Tribunal and subject, in certain circumstances, to the rights of any interested user to object. The retention of much of the former statutory regulation, and some additions, on the whole increased the regulatory and commercial grip on the railway rates system. In practice, the great bulk of exceptional rates, which the extended classification had been intended to obviate, were brought forward into the new rates structure.

The rise of road haulage, with its unregulated rates and freedom to enter the main traffic streams where conditions conducive to economic operation were most readily to be found, presented the railways with serious competition. The railway system of charging could not co-exist with a selective competitor who took only favourable transactions. The Act of 1953 removed from the Commission the former statutory obligations as to equal treatment and undue preference and annulled the provisions of the Road & Rail Traffic Act, 1933, as to the making of agreed charges. A new and wider power was given to make a free bargain with an individual trader as to the charge for the carriage of all or any part of his goods. As regards the charges schemes to be prepared under the provisions of the 1947 Act, some important changes were made. Any such scheme was required to provide for maximum charges. Where maximum charges were considered neither practicable nor desirable the scheme could authorise the Commission to make reasonable charges, which, however, would be subject to the right of appeal to the Transport Tribunal. Apart from this, the scheme was to secure that the charges to be made were left to the discretion of the Commission without condition or limitation. The maximum charges would be the only charges to be published.

When the scheme comes into force, the provisions of Part III of the Railways Act, 1921, with one or two exceptions, cease to have effect. Three things seemed clear. Under a competitive régime, rate-making must give far greater significance to factors reflecting comparative cost: operational circumstances in the carriage of goods by railway were bound to show an extreme diversity and therefore cover a very wide variation in cost: and the change from the old to the new must be in the nature of a blend rather than a rupture. The Commission intends that all transactions—not individually, but grouped in such a way as to give a reasonable commercial rates system—shall cover their direct costs and make such contribution towards the indirect costs as the market permits. In freight transport the unit of carriage is the wagon, and costs may be assessed in reference to wagon transits, but commercial usage requires that charges should be expressed per ton carried. The charge for any given consignment therefore turns on the weight and quantity of that type of goods which can be loaded in the wagon. This factor of loading has been given the name "loadability." The main body of the draft scheme ran to no more than 20 clauses and was supported by two schedules of comparative brevity. The maximum charges were in seven gradations, from 10 tons downwards. The gradation was selected by reference to the weight of the consignment and its loadability.

Loadability was defined as the weight of the goods comprised in the consignment which can be loaded and safely carried in an open 10-ton wagon with a capacity of 450 cu. ft. This definition, with some provisions as to the size of the wagon, is retained in the scheme as approved. The heavier the weight of the consignment, and the better its loadability, the lower the gradation of the maximum charge. The maximum charge is expressed in two elements, a rate per ton for the first 10 miles and a rate per ton per mile thereafter. The first, Mr. Pike explains, is in the nature of a standing charge, covering those services and facilities which do not vary with distance. The second covers the balance of wagon cost, trunk haulage, intermediate marshalling, and other elements. The Transport Tribunal has agreed that maximum charges should meet the costs of transit in adverse but not extreme circumstances, but has taken a more optimistic view of what such costs can be. It has also introduced different maxima for certain defined traffics when loaded in bulk. It has accepted the broad view of terminal services suggested by the Commission but only in regard to station traffic. For private siding traffic lower maxima are provided for what might be termed "conveyance" leaving any services in connection with the private siding to be dealt with on the familiar basis of reasonable charges. On these points, Mr. Pike thinks the Commission can fairly claim to have achieved its main objectives. The reduced level of maximum charges and the provisions in regard to traffic in bulk and to private sidings are more restrictive than it had hoped but not unduly so. The rather surprising item in the Tribunal decision, in Mr. Pike's opinion, is the conclusion that it is undesirable to fix maximum charges for the carriage of goods carried in owners' wagons or any consignment weighing 100 tons or more. In such cases the Commission is authorised to make such charges as may be reasonable and any question as to reasonableness will be determined by the Transport Tribunal.

There is no more important work in the commercial branch of railways, he considers, than that of fixing prices. The scheme, with the liberties of the 1953 Act in the background, leaves the main responsibilities with the rate-makers of the future, who within its authority must re-shape the railway system of charges on the principles upon which it is based. The first phase of the problem is to blend the old with the new. Time has built up a great mass of exceptional rates. It is the announced intention of the Commission that most of such rates which are in active use shall be brought forward into the new system. The rest will be left behind. The continued rates must be reviewed in course of time and tested against the new principles, but this step should give both trader and railwayman time to adjust themselves to the new atmosphere and avoid sweeping disturbances of trade and industry. The second and concurrent problem, already being tackled, is to frame the lines of domestic arrangement and control of rates. However far this may proceed, a greater responsibility will be left with the rate-maker. He must have a greater understanding of the elements in the service he is pricing and of their comparative cost. He must be ready to press for better and cheaper methods to be adopted when expense prevents him from matching a competitive price. In the longer run he is accountable for the results of his work in terms of net revenue.

Trans-Zambesia Railway

THE report for the year ended December 31, 1955, of the Chairman, Mr. V. L. Oury, and Directors of the Trans-Zambesia Railway Co. Ltd., shows that operating receipts amounted to £872,994 compared with £772,696 in the previous year, whilst expenditure, including provision for renewals, was £633,061, representing 72·52 per cent of the gross receipts, compared with £565,498 (73·19 per cent) for the previous year. The net operating surplus was, therefore, £239,933 compared with £207,198 for the year 1954. The General Manager of the railway is Mr. H. W. Stevens, who is also General Manager of the Nyasaland Railways.

The following are some of the principal results:—

—	1954	1955
Total tonnage	562,789	687,125
	£	£
Passenger traffic receipts	105,385	106,941
Goods traffic receipts	638,809	738,343
Parcels and luggage receipts	14,580	14,292
Livestock and vehicle receipts	4,982	4,846

The company received the sum of £78,000 from the Government of Nyasaland, being the balance of a total sum of £128,000 which that Government agreed to advance to finance the first phase of ancillary works in the company's present five-year capital programme. During the

year the Government of the Federation of Rhodesia and Nyasaland agreed to advance £475,000 to cover the cost of rolling stock and ancillary works included in the second and final phase of the five-year capital programme. At December 31, 1955, an initial advance of £50,000 had been received under this arrangement. With the development taking place there is no doubt, Mr. Oury states, that to increase the potential traffic density of the line expenditure must be increased on improving the track, providing more rolling stock, houses for additional staff, further water supplies, etc. This will require considerable new loan capital, much of which will not immediately result in additional revenue.

Rolling stock put into service during the year included 55 high-sided open wagons and 23 covered wagons. The company also had on order two further "G" class locomotives from the Vulcan Foundry Limited. Four fourth-class passenger coaches had also been ordered from Cravens Limited.

The tonnage handled at the port of Beira—2,763,509 metric tons—again constituted a record. There are, however, signs that the new rail link between Lourenço Marques and Southern Rhodesia, opened for traffic last August, may have some temporary effect on the tonnages passing through Beira. The board understands that a start will shortly be made to extend the existing Nacala/Cuamba line westwards to a point on the eastern shores of Lake Nyasa.

Nyasaland Railways Limited

THE report for the year ended December 31, 1955, of Nyasaland Railways Limited, of which Mr. W. M. Codrington is Chairman and Mr. H. W. Stevens General Manager (and also General Manager of the Trans-Zambesia Railway), shows that operating receipts amounted to £891,843 compared with £855,861 in 1954. Operating expenditure rose from £651,580 to £728,767, leaving a net operating surplus of £163,076 compared with £204,281 for the year 1954. The ratio of expenditure to receipts was 81·71 per cent compared with the 1954 figure of 76·13 per cent. After providing £61,060 for interest on the 3½ per cent First Debenture stock and £127,550 for interest at the agreed rate of 4 per cent on the Consolidated Income debenture stock, the directors were able to increase the recommended distribution to the ordinary shareholders from 2½ to 3½ per cent.

Some of the principal results appear below:—

—	1954	1955
Goods tonnage (railway)	372,199	383,255
	£	£
Goods receipts	631,378	650,488
Livestock and vehicle receipts	2,748	2,688
Passenger receipts	127,847	128,895
Luggage and parcels receipts	12,715	15,033

Reference is made in the report to the intention of the Board to raise further prior charge capital for much needed additional facilities to cope with increasing traffics. It had been hoped that the legal formalities involved in such an operation would have been quickly completed, but the rise in the bank rate and the credit squeeze intervened before the company could raise the new money. It has, therefore, had to conserve as much cash as possible in order to meet the cost of new works, new rolling stock, and so on. On the strength of its own cash resources the company placed orders for two more "G" class locomotives with the Vulcan Foundry Limited, and four African passenger coaches with Cravens Limited. It was hoped to take delivery of the locomotives at the end of 1956. The coaches will not be available till the end of 1957. The associated company, the Trans-Zambesia Railway, at the same time placed orders for similar motive power and rolling stock. When delivered all these will form part of the pool operated by the Nyasaland Railways in conjunction with the T.Z.R.

Though some mineral exploration is taking place in Nyasaland, no valuable minerals which would carry remunerative rates have so far been discovered. Mr. Codrington points out that increases in low-rated agricultural products such as maize, or the carriage of low-grade minerals, might be of little direct value so far as an increase in net receipts is concerned. There are, however, signs of industrial development which indicate recognition of the advantages of Nyasaland for certain types of secondary industries. Progress in this direction would undoubtedly be stimulated as soon as cheap power became available in quantity; but though a start is being made on a cofferdam or barrage which will help to stabilise the level of Lake Nyasa, it is unlikely that a start will be made with the big hydro-electric scheme in the near future.

The loss on operating the Nyasa Lake service during 1955 at £45,465 was somewhat less than the previous year's loss of £53,591. The reduction in the rate of interest from 5 per cent to 4 per cent on the Consolidated Income debenture stock—a saving to the company of nearly £32,000 per annum—was agreed with the Central African Federal Government in return for which the company undertook to continue to operate the Lake service. The new vessel the company is erecting for account of the Federal Government was recently launched and should be in service by the beginning of next year.

In April, 1956, the line near Chiromo was breached as a result of a cyclone. A temporary bridge was built across the gap within 19 days. As an emergency measure, passengers and goods were transported by the stern-wheel steamers which had at one time been used on the Zambesi. The report refers to the excellent service provided by the Drewry railcars between Limbe and Chipoka.

Development of Road Transport in India

INAUGURATING the Delhi Branch of the Institute of Road Transport, the Indian Deputy Minister for Railways & Transport, Mr. Shah Nawaz Khan, stated that the Government of India was seriously considering how best to use road transport for handling more traffic, and that the interests concerned had already been asked to prepare schemes for setting up large units for long-distance operation in areas where railway carrying capacity is small. The Government would be prepared to make relaxations in the distance restrictions laid down by the Code of Principles & Practice in the Regulation of Road Transport, to render assistance in obtaining permits for inter-State operation, and to give other necessary facilities. It is hoped that the private sector will make full use of this opportunity and give an effective proof of the capacity of road transport for handling the transport problem as efficiently and economically as any other carrier.

For the achievement of the targets set by the second Five-Year Plan, the development of all modes of transport to their fullest capacity is absolutely necessary. The Government of India, being aware of the situation, has already taken decisions, in consultation with the Planning Commission, to strive for an increase in the capacity of the railways by about 40 per cent during the next five years; to increase the tonnage of coastal shipping by about 100,000 tons; to expand and develop inland waterways to carry almost twice their present capacity; and to eliminate the inhibitory factors, as far as possible, in the development of road motor transport, which is still largely in the hands of private operators.

According to the production targets set by the Planning Commission, the railways were originally expected to carry an additional 61 million tons. The 40 per cent increase in their capacity would, however, add only 47 million tons to their present capacity of about 115 million tons. There would therefore be a gap of about 14 million tons. This gap might increase further if the revised production targets, which have increased the tonnage of cement by three million tons and that of foodgrains and general goods by about 10 million tons, materialised. A part of this total gap of 27 million tons may be offset against the increased capacity of coastal shipping and inland waterways which

today is nearly five million tons and is likely to be doubled by the end of the Plan period. The balance would have to be carried by road transport, but road transport has also to cope with the increase in the feeder traffic, which must necessarily arise as a part of the overall increase in the demand for transport. This makes the role of road transport very important in the execution of the Five-Year Plan.

Road transport in India today employs nearly 100,000 vehicles, carrying only 18 million tons. With better organisation the carrying capacity of these vehicles could be easily increased by 30 to 50 per cent. It is reasonable to expect that the next five years will bring an additional 60,000 or so vehicles on the road and these could carry another 15 to 20 million tons. Most of this capacity will, however, be used for carrying feeder traffic to the railways. For road transport to act as a supplementary carrier, the Government believes today that there is a need to develop long-distance road traffic, even on routes parallel to the railways. This presents a radical change of view. After an increase in the capacity of many important railway lines, we doubt whether economic development will be carried in the foreseeable future as far as providing enough traffic to nourish both rail and road on parallel routes.

The problems of road transport in India differ greatly from those in Western Europe. Distances are long and the communities served largely rural. Roads are not everywhere anything like as well developed, and therefore the system of operation and maintenance of road services must differ from anything known in the West. It is necessary to adjust the training of the operational and technical staff in conformity with these peculiar conditions. At present there are not enough trained technicians in the country. The road haulage industry is largely in the hands of small and technically untrained operators, who cannot organise their activities economically and scientifically. Their standards need to be raised and a larger number of men will have to be trained to produce the necessary manpower for the fast expanding industry. It is for consideration whether a proportion of the potential trained manpower would not be better employed on operating, maintaining, and improving the railways—and in training other railwaymen; for a core of men well-trained in the several aspects of railway work exists, with good facilities for training, in most cases capable of expansion to deal with increased intakes of staff. The railways are probably India's most valuable public utility. They have the advantage of long experience, and can be readily increased in capacity—as they are being in many cases. Before embarking on ambitious schemes of road transport—a relatively unknown field—it would be as well to consider how best to make every possible use of the well-tried and well-equipped railway system.

LETTERS TO THE EDITOR

(The Editor is not responsible for opinions of correspondents)

The Wotton Tramway Locomotive

February 1

SIR,—I refer to the report in your January 25 issue, of the presentation of this locomotive by Mr. G. Alliez, Chairman of the Industrial Locomotive Society, to the British Transport Commission. An old photographic print depicts one of these engines on the Brill line, drawing a train of five vehicles. From its general appearance, it would seem to have possibly been the second of these locomotives, as the chimney was longer than that of the machine preserved by London Transport, and was surmounted by a primitive form of spark arrester in the shape of an inverted caketin. The overhead cylinder was covered by a metal plate, whilst a cab of attenuated format was fitted, and stayed to the aforesaid plate.

The two enginemen are on the front and side of the locomotive, one apparently in the act of oiling the cylinder piston whilst the other is close to the flywheel, which is in motion.

Yours faithfully,

ALAN T. NEWHAM

2, Summerhill Avenue, Dunlaoghaire, Co. Dublin

Inter-City Electric Trains

February 3

SIR,—At this stage in the modernisation programme, a decision must be made about the type of electric trains to be used on fast services on runs of about 50-150 miles between terminals. As such services are usually of a regular-interval nature, multiple-unit rather than locomotive hauled stock may be expected to be chosen, but has several serious disadvantages.

These are: (1) Lack of flexibility in formation, both as to number of coaches, and regarding such matters as the ratio of first to second class accommodation; (2) waste of space because of an excess of unused driving cabs and guards' compartments; (3) need for special sets including buffet or restaurant cars, and so on; (4) technical difficulties in high-speed running with too many pantographs raised; (5) if more than three- or four-car sets are used, serious loss of user result if one vehicle of a set becomes unserviceable, apart from consequence of in-service failure.

The answer seems to be provision of stock as under:—(1) Powerful motor coaches of 1,250-1,500 h.p., one-hour rating, with second class, baggage, and guards' accommodation and drivers' cabs at both ends; (2) a few driving trailers, also double-ended; (3) a selection of ordinary standard coaching stock, fitted with control cables, and so on. This would enable trains with all the advantages, but none of the disadvantages, of multiple-unit stock to be made up to local traffic requirements.

Yours faithfully,

JOHN RODGERS

132, Worrin Road, Shenfield, Essex

Site for a Transport Museum

January 26

SIR,—Something very odd seems to be happening in Brighton. First, our locomotive works was to be closed, but nothing was to be said definitely for fear of upsetting those who earned their living there. Then there was some apparent sympathy for a project for converting the redundant works into a national museum of transport. But again there were soft whispers that the thing should not be too openly discussed.

Now we learn from our very respectable local papers that there is a proposal to turn the works over to the manufacture of components for light German motorcars, under licence. For the third time we understand that the British Transport Commission does not want it talked about.

And no wonder! Is the Commission letting in a German Fifth Column to work against the presently embarrassed British motor industry? Or to flood the roads with still more cheap cars (when there is plenty of petrol again) and so accelerate the long-desired withdrawal of local railway passenger services? Quite apart, sir, from the supposed suspension of the transport museum idea, which would have benefited education as well as the towns of Brighton and Hove, this is a grievous thing, which throws a very peculiar light on the secret diplomatic methods of the British Transport Commission.

Yours faithfully,

C. HAMILTON ELLIS

33, Norfolk Square, Brighton, 1

THE SCRAP HEAP

Britain by Diesel

Nobody who has not ridden on the front seat of a diesel knows anything about the English countryside. The saddle of a horse, the seat of a cycle, the top of a bus, they all give differing views and result in different impressions; but the front seat that looks along the lines of a single-track railway, revealing numberless little level crossings between field and field, umpteen tiny culverts over stream and ditch and drain, all the intimacies of the farmyard—that's unique.—*From "The Times.*

Railway to the Forbidden City

An aerial survey is being carried out for a railway from China to Lhasa. . . . We must try not to be too miserable about it. Perhaps the old Tibetan traditions may survive in an altered form. If the new Tibetan State Railways are anything like our own, these traditions may even acquire fresh value.

Grilled yak steaks, with bowls of hot buttered tea laced with salt, raisins, oatmeal and sunflower seeds, should go down very well in the first class restaurant cars. Levitation will, of course, be strictly forbidden while the train is in motion. . . . When the heating fails, passengers will be able to practise the old Tibetan technique of keeping warm in a temperature of 50° below zero, simply by imagining you are a huge flaming lotus.—"*Peter Simple*" *in* "*The Daily Telegraph.*"

Early Malayan Coach

The Sultan of Perak recently opened the exhibition of a coach of the former Perak State Railways, now installed on the platform at Ipoh Station, the principal station in the State of Perak, as a memorial to the pioneers of railway development in Malaya. Malaya's first railway was opened in Perak in 1885, between Taiping and Port Weld, eight miles. The success of this first line resulted in rapid railway development. Between 1885 and 1903, 214 miles of line were brought into service in Perak State alone. In 1903 the lines of the Perak State and Selangor State Railways were joined to establish through rail communication between Prai (Penang) and Seremban. The two State Railways had already been amalgamated in 1901 as the Federated Malay States Railways. The exhibition coach, built in 1892, is of wooden construction to a clerestory pattern and is mounted on a steel underframe. It was found to be at Sentul Works, Kuala Lumpur, after the Japanese occupation and was rebuilt to its original design at Sentul in 1955 to drawings supplied by the original builders, the Metropolitan-Cammell Carriage & Wagon Co., Ltd.

Mileposts and Gradient Boards

Wayside indications of distance date back to the earliest days of civilisation, and in this country mileposts were placed by the Romans alongside their roads, and were in common use on turnpike roads and canals before the coming of the railway. This practice was also followed by some early railway companies, and certain of these may have had a clause to this effect in their Acts of Incorporation. The provision of marked posts at intervals of a quarter-of-a-mile was made obligatory by Section 94 of the Railway Clauses Act of 1845, which reads: "The company shall cause the length of the railway to be measured, and milestones, posts, or other conspicuous objects to be set up and maintained along the whole line thereof, at a distance of a quarter-of-a-mile from each other, with numbers or marks inscribed thereon denoting such distances." On the other hand, there is no legal obligation in the United Kingdom to provide gradient boards along a railway; these indications of changes in gradient are provided as a matter of administrative convenience, for the guidance of enginemen and other members of the staff whose duties take them out on the line.

Salad Days

After the feverish long-distance road jostle I find express-train travel is a rest cure. Restaurant car meals, too, are a great improvement on the snack dashed down with one eye on the clock.

How good railway meals are. On the "Merchant Venturer," West Region's London-Bristol express, I had a four-course dinner—asparagus soup or tomato juice; turbot; roast beef, horse-radish sauce, roast and boiled potatoes, sprouts and peas; choice of two sweets or four cheeses—for 9s. 6d. The steward's "Will that be enough, sir?" is, within reason, an invitation to the traveller to take more than the normal generous portion, and the service is up to best restaurant standard.

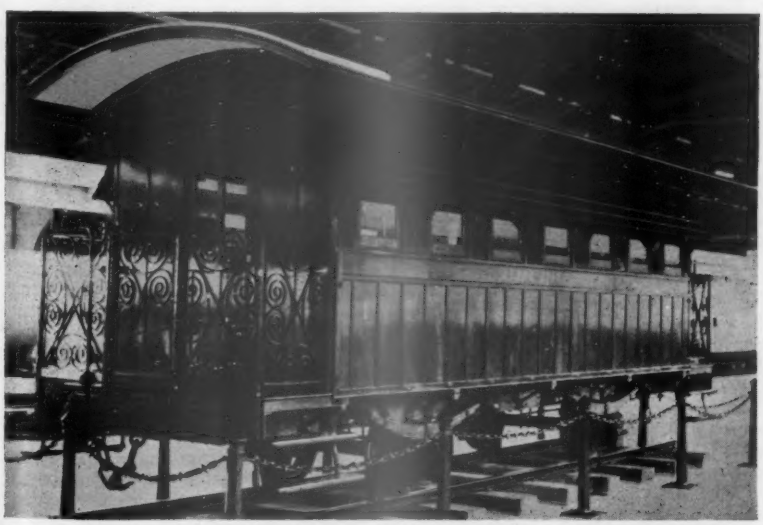
In the Western Region there is *always* salad—watercress, celery and radishes—with the cheese: in a tradition so old that no man in the company can remember how or when it started. . . . In the course of 100 or so dinners on trains I have had only one bad one. That was on a London-Cardiff train, but the Western Region has more than made up for it since.—*John Arlott in the* "*News Chronicle.*"

"Carefree Curves"

(*See our issue of January* 25)

I'm sure the rank and file of railwaymen
Are grateful for this lubrication gen;
It's quite a change from gloomy perturbation
About the general railway situation.
It seems that, when rough riding racks the nerves,
It pays to study films like "Carefree Curves"—
Intriguing title, hinting, I confess,
At curvilinear attractiveness—
Yet, far from featuring the fickle fair—
This merely has to do with wear and tear.
With Porter Bill the idea seemed to rate
As one more blessing from the Welfare State,
And one, moreover, from his point of view,
A little tardy, if not overdue.
He said that he, for one, could always find
Room for the lubricant he had in mind
And felt that anything which helped to send
Poor railwaymen more gently round the bend
Was something he was predisposed to favour,
Pending more data about strength and flavour!

A. B.



Former Perak State Railways coach built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd. in 1892 *and now at Ipoh Station, Malayan Railway*

OVERSEAS RAILWAY AFFAIRS

(*From our correspondents*)

NEW ZEALAND

Order for 200 Meat Wagons

To speed up shipments of frozen meat, the Railways Department is calling tenders from overseas firms for the supply of 200 insulated wagons. The General Manager of Railways, Mr. A. T. Gandell, has stated that this action follows a Government direction that urgency be given to the manufacture of insulated wagons; that the 200 wagons will increase the insulated rolling stock by one-seventh; and that it is considered that with these additions the Department will have adequate rolling stock to meet the requirements of the frozen meat industry.

Tenders for the new wagons will close in a few weeks. Delivery dates quoted by overseas manufacturers will be a main consideration.

INDONESIA

Five-Year Development Plan

In the 1956-60 five-year development plan for the State Railways, no new line construction is envisaged; the total mileage in all parts of Indonesia is some 3,800. Measures to increase railway capacity include introduction of 95 diesel locomotives.

INDIA

Mechanised Yard at Moghalsarai

Mechanised working is to be introduced at Moghalsarai, the largest railway marshalling yard in India, and the nerve centre of rail communication in the eastern part of the country.

Visakhapatnam Port Control

The control and management of the port of Visakhapatnam (formerly Vizagapatam) was recently transferred from the Ministry of Railways to the Ministry of Transport. The port was originally developed by the Bengal Nagpur Railway, and the facilities were increased during the last war.

First Cinema Car in Regular Service

The first cinema car in a regular passenger train in India went into service recently. It is used both as a cinema car, and as a buffet car when films are not being shown. Admission is regulated by a nominal fee of two annas per passenger. Passengers have to squat on the floor, so that a larger number can be accommodated. The cinema car operates between Jhajha and Kanpur, 406 miles, and is attached to the Howrah-Delhi express.

Survey for New Line in South

The Railway Board has sanctioned a traffic survey for a new line of the Southern Railway between Chinnasalem and Chingleput via Kallakurichi, Tiruvannamali and Wandiwash.

The new line, if constructed, would go a long way to serve important commercial and agricultural centres in the North and South Arcot and Chingleput districts in Madras State. Whilst providing transport facilities for the produce of chillies and tobacco, it would open up undeveloped areas.

UNITED STATES

Longest Vertical Lift Span

In December, 1956, the Baltimore & Ohio Railroad awarded a contract to the American Bridge Division of the United States Steel Corporation for the construction of the longest vertical lift span bridge in the world, at a cost of $5,800,000 or just over £2,000,000. The span will be 558 ft. long, providing a clear navigation channel of 500 ft. in Arthur Kill, a sea arm separating Staten Island from New Jersey. It is part of a 1,644-ft. bridge, and will replace a swing span with a 200-ft. opening. The new span will be of the through truss type weighing about 2,000 tons, and will be able to be raised or lowered through a height of 135 ft. in about 2 min.

The lift span will carry a single line only, and as the navigation traffic is heavier than the rail traffic, it is expected that the normal position of the span will be raised. Altogether there will be some 4,000 tons of structural steel and 500 tons of castings and other steelwork used, including steel lifting towers. As an improved waterway will be provided, the U.S.A. Corps of Engineers will share in the cost of the new structure.

ARGENTINA

Report on Railway Situation

The Argentine Ministry of Transport has prepared a 46-page report on the situation of the Government owned transport undertakings, and convened a press conference to elaborate on different aspects of the material in the report. Regarding the railways, the Minister referred once again to the dissolution of the State transport undertaking, which was formed by 20 State-owned companies, unable to operate freely because of the cumbersome administrative structure.

The biggest obstacle to be overcome, he stated, was the huge deficit, which he estimated to be 2,600 million pesos for the railways and 650 million pesos for Buenos Aires Transport during 1957.

The acquisition of new rolling stock and locomotives, and acceleration of repairs, would help to reduce the deficit, but the greater part was due to salaries and wages, for which reason a solution would have to be found in order to alleviate some part at least of the burden. Increased productivity was one of the matters being urgently studied. It was hoped that in 1957 the railways would be in a position to accept all the traffic which might be offered.

The position as regards new diesel-electric locomotives was summed up as follows: Already contracted, 10; tenders accepted, 200 (of which 150 would be financed by the recent export-import bank loan); already acquired, 21; tenders to be called for shortly, 105; and local construction with imported engines over the next four years, 280.

Fire at Urquiza Railway Shops

The repair shops of the General Urquiza Railway at Villa Lynch were completely gutted by a fire which broke out on January 9. The machinery and installations were totally destroyed, as were a number of electric coaches under repair or being painted. Damage was estimated at 15 million pesos.

FRANCE

Seat Reservation Centres

Reference was made in *The Railway Gazette* of June 11, 1954, to the various centres set up by the S.N.C.F. to meet the peak period seat reservation needs of passengers in areas where traffic is spread over a number of adjoining stations. Further developments have taken place since that time and, during the years 1947-55, in all, eight such centres have been established in the Mediterranean Region alone.

The Nice centre now deals with the requirements of 25 stations for three weeks ahead and the additional work has made it necessary to provide new equipment. The new reservation drum is in seven layers and is 31 ft. 2 in. in circumference. During 1955 more than 600,000 reservations were handled at Nice, of which nearly 120,000 were made during the peak holiday month of August.

The other centres are at Marseilles, Perpignan, Nîmes, Avignon, Briançon, Millau, and Alès.

IRELAND

Effects of Petrol Rationing

Coras Iompair Eireann has stated that public transport in the Republic of Ireland has derived considerable benefit from petrol rationing. Greater use is being made of suburban train services. Long-distance trains are carrying more passengers than the average at this time of year. There has been a similar increase in freight traffic.

The Great Northern Railway also reports increased carryings of passengers, but no appreciable rise in freight tonnages. Other factors are at work, including the recession in the building trade, causing a sharp fall in cement traffic—a major item on the G.N.R. originating at Drogheda.

Track Loading Fundamentals—3*

Determination of ballast depth

By C. W. Clarke, M.I.C.E., M.I.Mech.E., M.I.E.Aust., M.Inst.T.

THE first step is to determine the Zimmermann load for a given wheelbase and wheel loads, in a similar manner as the Talbot load was determined, either using the graphical method shown in Fig. 2 for determining track depression, or by the use of standard forms as shown in Figs. 3 and 3a.

The Zimmermann load for Speed 0+ can be expressed mathematically as

$$ZL_o = (P + H_o + T_o)\,F_o \text{ lb.} \quad \ldots\ (53)$$

and for permitted speed V as

$$ZL_v = [P\,(1 + K_o) + H_v + T_v]\,F_o \text{ lb.} \quad (54)$$

where the coefficient F_o applies to a particular wheel and denotes increment in rail-seat loads due to loads on neighbouring wheels, and the impact factor K_o provides for increment in rail-seat loads due to speed effect. The factor K used in determining the increase in rail stress due to speed allows for both vertical and lateral loads on the rail, but since the effect of lateral loads cannot be transmitted through the ballast to the formation, the factor K_o is used to determine the increment in vertical loads due to speed effect.

The speed factor used by the German State Railways[1], apparently based on experiments conducted by C. Driesson, chief engineer of the permanent way section of the Netherlands Railways, is expressed by

$$K_o = \frac{V^2}{30{,}000} \quad \ldots\ (55)$$

where V = kilometres per hour.

Expressed in miles per hour this becomes, approximately

$$K_o = \frac{V^2}{12{,}000} \quad \ldots\ (56)$$

and is the factor used in determining the increment in wheel loads due to speed producing track depressions.

The maximum rail-seat load supported by a sleeper is, from equation 28, for uniform stiffness of sleeper supports

$$q_o = 0{\cdot}39\ ZL_v\ .\ S/X_1 \text{ lb.} \quad \ldots\ (57)$$

and it makes little difference whether the load is immediately over the sleeper or between adjacent sleepers.

Sleeper dimensions and sleeper spacing on a railway are generally standard, and the track engineer usually knows from experience what rail-seat load a sleeper will support for a specific depth of ballast without damage to the roadbed, so the problem generally is to determine what value of ZL_v can be permitted for a known safe value for rail-seat loading.

From equation 57 the value of ZL_v is

$$ZL_v = 2{\cdot}56\ q_o X_1/S \text{ lb.} \quad \ldots\ (58)$$

If the track engineer does not know his safe sleeper loading, he knows the heaviest locomotive his track is carrying with safety, and can calculate the value ZL_v for this locomotive and so determine the safe value for rail-seat loading from equation 57. However, if the value ZL_v produced by a new or projected type of vehicle is above the figure the formation will carry without danger of sinks forming or ballast being crushed into the roadbed, and yet the value TL_v for the same vehicle does not exceed allowable rail stress values, it means the rails are of adequate section, but ballast depth must be increased to reduce the intensity of pressure on the roadbed.

Distribution of Pressure on Ballast

Tests conducted by the special committee working under the direction of Dr. Talbot determined the distribution of pressure in the ballast under a sleeper as shown in Fig. 6, which gives the intensity of pressure as a percentage of the load on the sleeper. If the per-

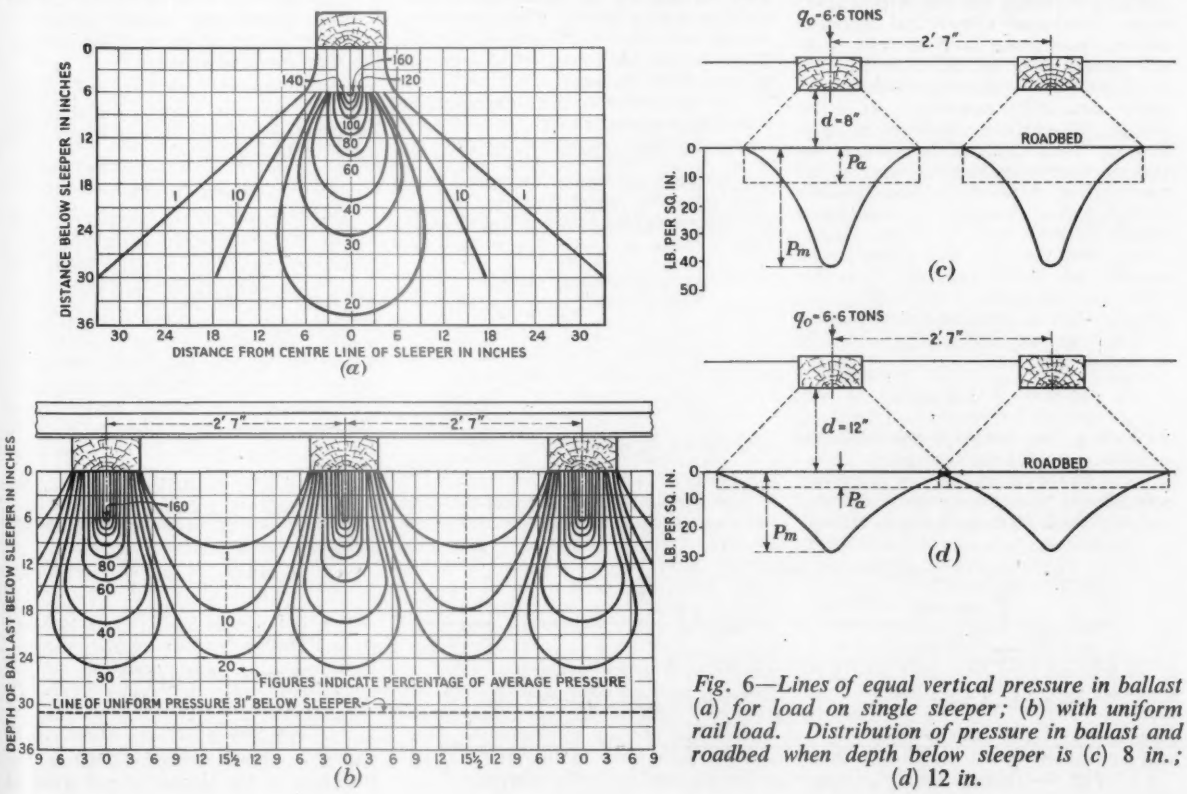


Fig. 6—Lines of equal vertical pressure in ballast (a) for load on single sleeper; (b) with uniform rail load. Distribution of pressure in ballast and roadbed when depth below sleeper is (c) 8 in.; (d) 12 in.

* Parts 1 and 2 appeared in our issues of January 11 and January 25, respectively

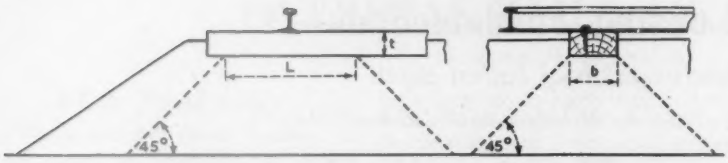


Fig. 7—Ballast load distribution pyramid

centage value for the maximum pressure vertically below the centre of the rail-seat is plotted against depth of ballast it gives a curve which can be expressed closely by the equation

$$P_m = \frac{10}{d} \times \text{intensity of load on sleeper} \quad \ldots\ldots (59)$$

It will be noted the rate of decrease in maximum intensity of bearing pressure with increase in ballast depth is considerable for shallow ballast depths, but decreases as ballast depth is increased. For example, increasing ballast depth from 5 in. to 7 in. reduces the maximum intensity of pressure on the formation by 28 per cent, but the gain in increasing ballast depth from 8 in. to 10 in. is 20 per cent and from 12 in. to 14 in. only 14 per cent. By increasing ballast depth the rail-seat load supported by a sleeper, computed from equation 57, can be increased without increasing the intensity of pressure on the formation, and for a given sleeper loading the pressure on the formation varies inversely as ballast depth.

To take an example, suppose the track engineer knows that the 4-6-2 type locomotive previously considered, with 7-tons on driving wheels, which at 45 m.p.h. produces Talbot and Zimmermann wheel loads of 8·16 and 14·46-tons respectively, is about the heaviest loading his particular roadbed can carry on 60-lb. rails laid on 6 in. ballast lift. He is then asked if a heavier 4-6-2 type with 8·5-tons on driving wheels could be carried at the same speed. His calculations show the Talbot and Zimmermann wheel loads would be 9·83- and 16·88-tons respectively, and the new locomotive could operate on 60-lb. rails at 45 m.p.h. without exceeding allowable rail stresses, but if maximum intensity of pressure on the roadbed is not to be exceeded then

$$\frac{10}{6} : 16{\cdot}88 :: \frac{10}{d} : 14{\cdot}46 \quad \ldots\ldots (60)$$

indicating 7 in. ballast depth would be necessary on this formation.

The average rather than the maximum intensity of pressure on the roadbed is usually required to be known. It may be assumed the portion of the ballast regarded as effective in transferring the load on the rail-seat to the roadbed is that forming an imaginary pyramid as shown in Fig. 7, with the sides at an angle of 45 degrees to the vertical. This is a rational approximation of the Boussinesq theory, as will be shown later. If the effective area of a sleeper on the ballast under a rail-seat is bL square inches, the area R at the base of the pyramid, as shown in Fig. 8, can be expressed as

$$R = c \,.\, bL \,.\, d \text{ sq. in.} \quad \ldots\ldots (61)$$

which gives the base area expressed as a close approximation in terms of the effective bearing area under the sleeper and the ballast depth. The ratio is not strictly constant, but increases slightly as the width and length of sleeper and ballast depth increase.

The value of R can be expressed as a first approximation by

$$R = 0{\cdot}5\, bL \,.\, d \text{ sq. in.} \quad \ldots\ldots (62)$$

but the constant can be expressed more closely by the values given in Table 2, for ballast depths between 5 and 24 in.

TABLE 2. *Values of Constant* c *for Various Sleeper Widths*

Width of sleeper	Value of c
10 in.	0·58
9 ,,	0·57
8 ,,	0·56
7 ,,	0·55
6 ,,	0·54

and can be expressed as

$$c = (0{\cdot}48 + {\cdot}01\, b) \quad \ldots\ldots (63)$$

The distribution of contact pressure on the underside of a sleeper of infinite thickness would tend to be uniform, but as a sleeper is relatively flexible, the distribution of pressure along a longitudinal axis is as shown in Fig. 9. If the intensity of pressure under the rail-seat is known, the intensity of pressure at the end of the sleeper is given by equation 22. This is approximate since the elastic theory is not strictly applicable for a bar of short length supported on an elastic foundation.

The length of the effective bearing area can be expressed approximately as L, where

$$pL/2 \doteqdot p_1 Q \text{ in.} \quad \ldots\ldots (64)$$

but

$$p_1 \propto p(X_2 - Q)/X_2 \quad \ldots\ldots (65$$

$$\therefore L/2 \propto Q\left(1 - \sqrt[4]{\frac{Q}{t^3}}\right) \quad \ldots\ldots (66)$$

and can be expressed for practical purposes as

$$L = 2Q\left(1 - \frac{{\cdot}036\, Q}{\sqrt[4]{t^3}}\right) \text{ in.} \quad \ldots\ldots (67)$$

The values of L for various sleepers in use are shown in Fig. 10.

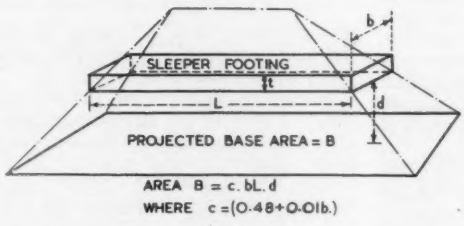


Fig. 8—Determination of base area of ballast pyramid

The area bL must be such that the ballast immediately under the sleeper will not fail by crushing. The intensity of crushing load is given by

$$q_o/bL = \text{pressure on ballast, p.s.i.} \quad \ldots (68)$$

but to prevent undue attrition the pressure should not exceed 35 p.s.i. for good stone ballast.

Sleeper Strength

The strength of the sleeper is computed by treating the overhang as a cantilever of length Q carrying a uniformly distributed load q_o/bL p.s.i. and ensuring that the flexural stress for the timber does not exceed the allowable value. The rail-seat load computed by the elastic theory must be doubled to allow for variations in sleeper supports. The tensile stress on the underside of sleeper below the rail-seat is given by

$$f_o = 6\,\frac{q_o}{bL} \cdot \frac{Q^2}{bt^2} \text{ p.s.i.} \quad \ldots\ldots (69)$$

and if the tensile stress is not to exceed 800 p.s.i. for live loads

$$t = \frac{0{\cdot}086\, Q}{b}\sqrt{\frac{q_o}{L}} \text{ in.} \quad \ldots\ldots (70)$$

If L is taken as 30 in., Q as 19·5 in., q_o as 17,500 lb. and b as 9 in.

$$t = \frac{0{\cdot}086 \times 19{\cdot}5}{9}\sqrt{\frac{17{,}500}{30}} \quad \ldots\ldots (71)$$

$$= 4{\cdot}5 \text{ in.} \quad \ldots\ldots (72)$$

and if q_o should exceed 17,500 lb. the thickness of the sleeper would have to

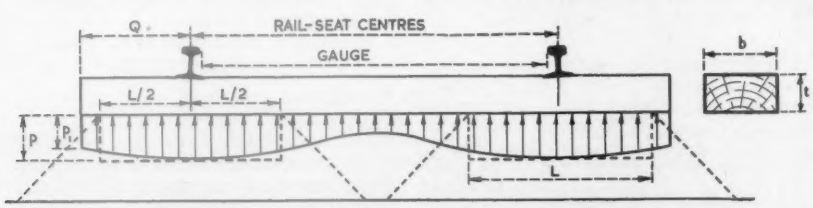


Fig. 9—Distribution of pressure on longitudinal axis of a sleeper

RAILWAY	GAUGE	SLEEPER SIZE	Q	t	L	Q/t
INDIA	METRE	6'-0" x 8" x 4"	14·75"	4"	23"	3·6
MALAYA	"	6'-6" x 10" x 5"	16·5"	5"	27·3"	3·3
COMMONWEALTH	3'-6"	6'-6" x 9" x 4½"	16·5"	4½"	26·8"	3·7
NIGERIA	"	6'-6" x 10" x 5"	16·5"	5"	27·3"	3·3
WEST AUSTRALIA	"	7'-0" x 9" x 4½"	19·5"	4½"	30"	4·3
COMMONWEALTH	4'-8½"	8'-0" x 9" x 4½"	17·75"	4½"	28"	3·9
BRITISH RAILWAYS	"	8'-6" x 10" x 5"	20·75"	5"	31·6"	4·1
AMERICAN RAILWAYS	"	8'-0" x 7" x 6"	17·75"	6"	29·5"	3·0
" "	"	8'-6" x 8" x 7"	20·75"	7"	33"	3·0
" "	"	9'-0" x 9" x 8"	23·75"	8"	39"	3·0
SOUTH AUSTRALIA	5'-3"	8'-6" x 10" x 5"	17·5"	5"	28·5"	3·5
INDIA	5'-6"	9'-0" x 10" x 5"	19"	5"	30"	3·8

Fig. 10—Effective bearing length for various sleeper sizes

be increased to ensure it is strong enough to carry the rail-seat loads. Besides considering the overhang as a cantilever the sleeper should be examined for strength as a beam between rail-seats if there are signs that the sleepers are centre-bound.

Too long an overhang, especially if sleepers are not stiff, can lead to end flicker under traffic, which tends to kick the ballast away at the ends. The stiffness of a sleeper varies as the cube of the depth, and the ratio Q/t should not exceed 4·3 if flicker is to be held within reasonable limits. On soft yielding formations sleepers can be increased considerably in length without trouble due to end flicker. Examples of such sleepers 10 ft. and 12 ft. long are those used by the Canadian Railways in swamps or muskeg. Since timber per unit volume is much more expensive than ballast, the overhang and effective length L can be reduced with advantage where ballast is deficient, and the money saved on timber spent in providing additional ballast. This does not apply where ballast depth is already adequate when to reduce loading on the roadbed sleeper length must be increased.

For example, reducing length of sleepers from 7 ft. to 6 ft. 6 in. could enable ballast depth to be increased from 6 in. to provide for 8 in. ballast lift. The reduction in the base length of the ballast pyramid would be about 16 per cent, but the gain in reducing bearing pressure on the roadbed by the 2 in. additional ballast would be 23 per cent. For a more accurate determination one of the series of Boussinesq's equations and an Influence Chart for vertical pressures would be used.

Taking the effective bearing length of a sleeper under a rail-seat as 30 in., equation 61 becomes

$$R = (0{\cdot}48 + 0{\cdot}01b) \,.\, 30\, bd \text{ sq. in.} \quad .. \quad (73)$$

If a sleeper width of 9 in. is considered, equation 73 then becomes

$$R = 154\, d. \text{ sq. in.} \quad ..... \quad (74)$$

and gives the bearing area at the base of the pyramid.

The average bearing pressure on the roadbed would be

$$p_a = \frac{q_o}{R} \text{ p.s.i.} \quad ..... \quad (75)$$

when from equations 57 and 61

$$p_a = \frac{0{\cdot}39\, ZL_v \,.\, S}{c \,.\, bL \,.\, d\, X_1} \text{ p.s.i.} \quad ..... \quad (76)$$

$$= \frac{0{\cdot}005\, ZL_v \,.\, S}{c \,.\, bL \,.\, d} \sqrt[4]{\frac{U}{1}} \text{ p.s.i.} \quad .... \quad (77)$$

and ballast depth required is given by

$$d = \frac{6{\cdot}39\, ZL_v \,.\, S}{p_a\, c \,.\, bL \,.\, X_1} \text{ in.} \quad ..... \quad (78)$$

The more accurate value given by equation 76 can be used, but for practical purposes it can be taken that R equals 155 d, when

$$p_a = \frac{0{\cdot}0025\, ZL_v \,.\, S}{d\, X_1} \text{ p.s.i.} \quad ..... \quad (79)$$

and

$$d = \frac{0{\cdot}0025\, ZL_v \,.\, S}{p_a\, X_1} \text{ in.} \quad ..... \quad (80)$$

The maximum intensity of pressure on the roadbed is given from equation 59 as

$$p_m = \frac{q_o}{bL} \cdot \frac{10}{d} \quad ..... \quad (81)$$

which shows from equations 62 and 73 that

$$p_m = 5 \text{ to } 6 \text{ times the value of } p_a \quad .. \quad (82)$$

and that for railway track the maximum intensity of pressure on the roadbed vertically under the rail-seat is between five to six times the average pressure on the formation, but as ballast depth increases the values of p_a and p_m tend to converge. With ballast depth less than 6 in. the maximum intensity of pressure on the roadbed beneath the rail-seat can exceed 200 p.s.i. and signs of excessive pressures are apparent when a sleeper laid on sandy ballast is removed due to age, and highly compacted ballast is found adhering firmly to the underside opposite the rail-seat bearing.

Sleeper Support Factors

The supporting values of sleepers under load are far from uniform and the stiffness of the rail support afforded by the roadbed, ballast and sleepers acting as a structure is most difficult to determine with any degree of accuracy. The standard of maintenance, regularity of track fettling, age and quality of the ballast and sleepers, and the drainage of the roadbed all influence the value in a great measure. On well maintained track a free rail generally rests on six or seven sleepers only. When a load is applied these sleepers are depressed first and through a greater range and carry proportionately more than their normal load. Furthermore, the effect of speed results in greater variations in sleeper pressures than in rail stresses produced, and variations in sleeper support are more important on stiff track than on softer track where the track modulus is of low value.

The depressions due to track loading will depend on various factors, but values shown in Table 3 may be expected.

TABLE 3. *Depressions Due to Track Loading*

Compressing sleeper and bringing it to a full bearing on the ballast	0·12 to 0·05 in.
Compression of ballast	0·05 to 0·15 "
Compression of roadbed	0·35 to 0·15 "
Deflection of rail between sleepers	0·03 to 0·01 "
	0·55 0·36 "

The experiments conducted by the Americans showed that due to play between the rail and sleeper, variations in fettling and the firmness of the roadbed structure, the load on an individual sleeper could be as high as 2·7 times the normal value computed from the elastic theory, and that increases of 66 per cent were frequent and fairly general, for which provision should be made.

In practice, owing to the variations in the values of the sleeper support, the allowable bearing pressure on the roadbed should not exceed 60 per cent of the safe load the soil will carry.

It is the usual practice to determine the rail-seat load deduced by the elastic theory, and to provide for variations in the track structure by taking the allowable bearing pressure on the roadbed as a percentage of the normal safe bearing pressure for the soil. Alternatively, if the normal safe bearing pressure for the soil is used, an allowance must be made to provide for increase in rail-seat load.

For example, if the value for the rail-seat load deduced from the elastic theory is used, the allowable bearing pressure on the roadbed would be 60 per cent of the normal carrying capacity of the soil, but if the value for the rail-seat load is increased by 66 per cent to allow for variations in the track structure, then the normal carrying capacity of the soil is taken.

The average bearing pressures various soils will carry are shown in Table 4.

TABLE 4. *Safe Average Bearing Pressures of Soils*

Soil	p.s.i.
Alluvial soils	Below 10
Made ground not compacted ..	11 to 15
Soft clay, wet or loose sand ..	16 to 20
Dry clay, firm sand, sandy clay ..	21 to 30
Dry gravel soils	31 to 40
Compacted soils	41 and over

The terrain traversed by a railway has roadbeds of widely varying qualities, with sleeper dimensions and spacing generally standardised for the class of road. Therefore, as a general rule ballast depth should be determined on the basis that the average pressures on the roadbed do not exceed 12 p.s.i. (0·77 tons per sq. ft.) for roadbeds not compacted before the track is laid, and 20 p.s.i. or more depending on the soil and compaction attained, where the roadbed has been compacted by mechanical equipment before the track is laid.

For track laid on alluvial soils special treatment is generally necessary, such

as piles driven below the formation or some form of stabilisation treatment. On poor quality roadbeds the allowable bearing pressure might be 8 p.s.i. only or even lower.

Elasticity of Ballast

The purpose of the ballast is to distribute elastically and as uniformly as possible the load on to the roadbed. If the 4-6-2 locomotive having a ZL_v value of 14·45 tons is considered, the ballast depth required, if the allowable roadbed pressure is not to exceed 12 p.s.i., is

$$d = \frac{0{\cdot}0025 \times 14{\cdot}45 \times 2{,}240 \times 32}{12 \times 29{\cdot}4} \quad .. \quad (83)$$

$$= 7{\cdot}4 \text{ in.} \quad ..... \quad (84)$$

and if the ballast depth is 5 in. only, the average pressure on the roadbed is

$$p_a = \frac{0{\cdot}0025 \times 14{\cdot}45 \times 2{,}240 \times 32}{5 \times 29{\cdot}4} \quad .. \quad (85)$$

$$= 17{\cdot}7 \text{ p.s.i.} \quad ..... \quad (86)$$

which bearing pressure on a weak formation is likely to result in sinks being formed during wet weather periods. An important finding of the American tests was that for track with a low track modulus, especially for shallow depth of ballast, the intensity of pressure could be higher than as shown in Fig. 6, and the concentration of pressure and the repeated application of pressure soon resulted in the load carrying capacity of the ballast and the roadbed being exceeded.

It should be noted how the bearing pressure of the sleeper varies in intensity from the centre line to its edge, showing the need when fettling for the ballast to be packed tightly along the edges of the sleeper for a distance of about 15 in. each side of the rail-seat. The ballast in the middle portion of the sleeper should be lightly packed to prevent the sleeper from becoming centre-bound. Ballast materials likely to movement under vibration, such as sand and gravel, are more likely to produce conditions resulting in centre-bound sleepers. For sleepers of appreciable thickness the length tamped would be increased.

With shallow ballast depth the entire load on the roadbed is concentrated on a comparatively narrow area under the sleeper, but as ballast depth increases the bearing area on the roadbed widens, although it is not until ballast depth exceeds 5 in. that there is any noticeable spread in the base area. When ballast depth is equal approximately to sleeper spacing the load distribution on the roadbed is fairly uniform, and it requires a ballast depth of about half the distance between the sides of adjacent sleepers before the entire length of the roadbed under the rails becomes loaded.

Voids in the Ballast

Since stone, gravel and sand particles possess practically no elasticity, the elasticity of ballast is due to the small voids between the ballast material, and in time settling of the ballast occurs and it loses its elasticity. This is restored by fettling which disperses the material and increases the voids between the particles. The vertical stability of the track depends on the elastic properties of the ballast structure being maintained, so that regular and thorough fettling is essential if the quality of the permanent way is not to deteriorate. The experiments conducted by the Americans showed that per inch of width the wider sleeper was appreciably more effective, and this is apparent from equation 63. For example, a given rail length might be supported by 12 sleepers 10 in. wide or 20 sleepers 6 in. wide for the same volume of timber used, and sleepers are generally sold per load of timber.

From equation 63, the value of cb for a 10-in. sleeper would be 5·8 and for a 6-in. sleeper 3·24, and $5{\cdot}8 \times 12 = 6{\cdot}95$ and $3{\cdot}24 \times 20 = 6{\cdot}5$, showing the advantage would be slightly in favour of the wider sleeper. However, there are slight discrepancies in the constants given in Table 2, otherwise the results would balance. The truer value of area R would be

$$R = (b + 2d)(L + 2d) \text{ sq. in.} \quad .... \quad (87)$$

and is an approximation for the loaded area computed from the Boussinesq equation.

The conclusion is that, for a given length and thickness of sleeper, and given load of timber, the pressure on the roadbed is dependent on the volume of timber per mile. In other words if sleeper spacing is proportional to width of sleeper, the load distribution on the roadbed is unaltered. A greater number of narrower sleepers per mile means more dog-spikes and fettling, but in the event of a decayed or flogging sleeper, or two adjacent defective sleepers, the variation in load distribution on the roadbed would not be so great, and closer sleeper spacing increases the lateral strength of track.

All too frequently permitted wheel loads are based on the loads the rails will carry, without regard to depth of ballast or loading on the formation. The result is that due to ballast deficiency the repeated passage of heavy loads breaks down the natural recovery of the foundation and sinks are formed in the roadbed. If four-wheel wagons loaded to 10-ton axleloads are carried on 45-lb. rails with 6 in. ballast lift, the intensity of pressure on the roadbed will be less than for the case of the same wagons carried on 60-lb. rails with only 4½ in. ballast lift, and it will be easier for the track gangs to maintain alignment and surface on the track with the greater ballast depth.

On good track effectively drained and well ballasted the value of the track modulus does not vary appreciably between dry and wet weather conditions, but where the values vary greatly the track is suspect and defective drainage and ballast deficiency are generally indicated. By reducing sleeper spacing ballast depth necessary is reduced, but the optimum relation between sleeper spacing and ballast depth will depend on local prices paid for sleepers and ballast. The ballast section adopted should be that expected to be in use 20 years after construction, by which time heavy out-of-face sleeper renewals generally become necessary.

Effective Drainage Required

Whereas in dry weather conditions the natural firmness of the roadbed will enable a high loading to be carried without much ballast depth, as soon as it becomes saturated with water and soggy its load bearing capacity is reduced, especially on clayey formations. Unless there is effective drainage and adequate ballast depth to reduce the intensity of loading on the formation, sinks will soon form with the repeated passage of wheel loads, or possible collapse of the roadbed. The formation of sinks in the roadbed soon leads to faults in alignment and top, which produce dangerous oscillations in a moving vehicle even at low speeds, which tend to cause derailments.

Sinks do not form with the passage of two or three trains, but with the repeated passage of trains which finally break down the natural recovery of the soil of the roadbed, if there is ballast deficiency. When the roadbed under a sleeper becomes depressed as a result of excessive pressures, the soil tends to be forced outwards and works into the ballast in the form of a slurry as the sleepers "pump" up and down under traffic. After frequent fettling the longitudinal section of the roadbed, with shallow ballast depth, assumes a sawtooth appearance with ridges between the sleepers. If this becomes pronounced the only remedy is to remove the track and scarify and consolidate the roadbed and then relay with ballast of adequate depth.

The locomotive has not been built yet which is too heavy to carry on a formation with safety, provided ballast depth and sleeper spacing are adequate. The Americans have locomotives carrying 34-tons on driving axles, operating at speeds in excess of 80 m.p.h., on track where the ballast depth is 24 in. or more with sleepers laid 3,000 to the mile. By increasing ballast depth the load is transmitted over a greater area of the roadbed, so reducing intensity of pressure on the roadbed. For example, by wearing snowshoes a man is able to walk over soft snow or by fitting bog shoes to a horse it can walk over soft ground, into which it would otherwise sink.

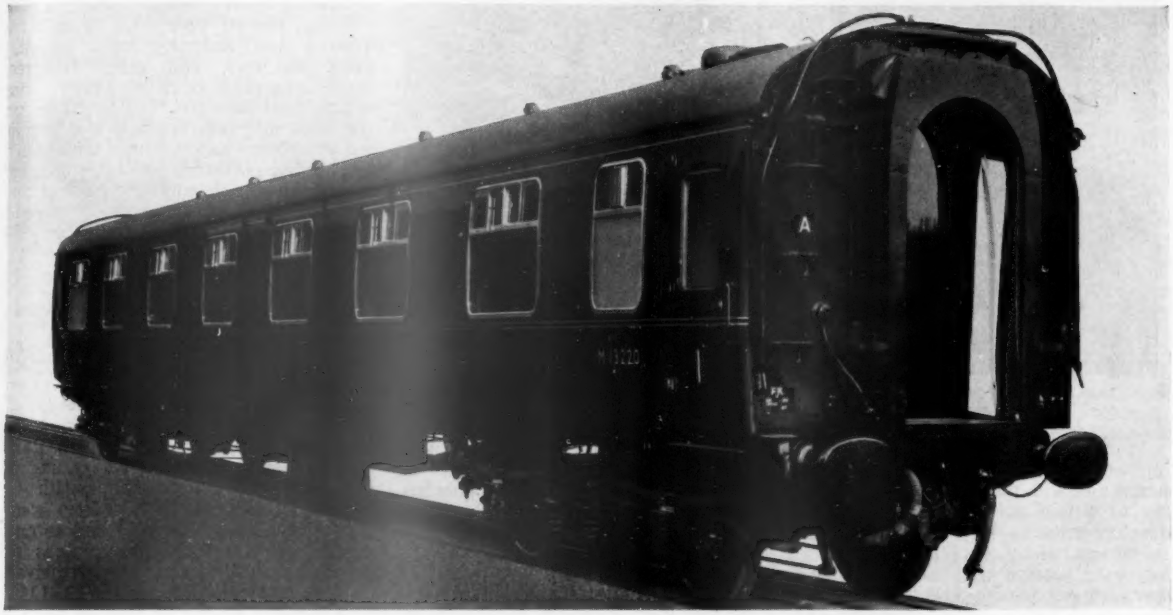
It is apparent from equation 51 that X_2 varies as $\sqrt[4]{S}$, and from equations 76 and 77 that for the same rail-seat loads the intensity of pressure on the formation: (*a*) varies inversely as ballast depth; (*b*) varies inversely as the fourth root of the moment of inertia of the rail section; and (*c*) varies directly as the fourth root of the cube of sleeper spacing. From this it follows that on a weak formation increasing ballast depth should be the first consideration. Increasing weight of rail is of little

(*Continued on page* 163)

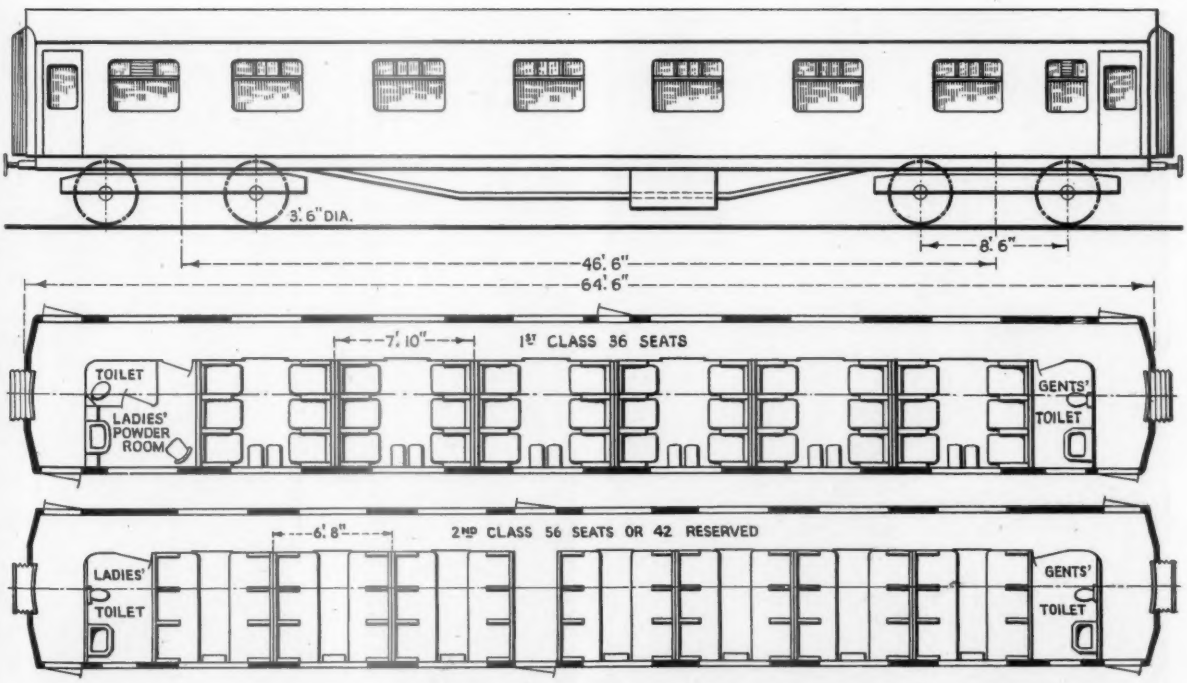
British Railways Prototype Coaches

Manufacturers given the opportunity to use individual designs

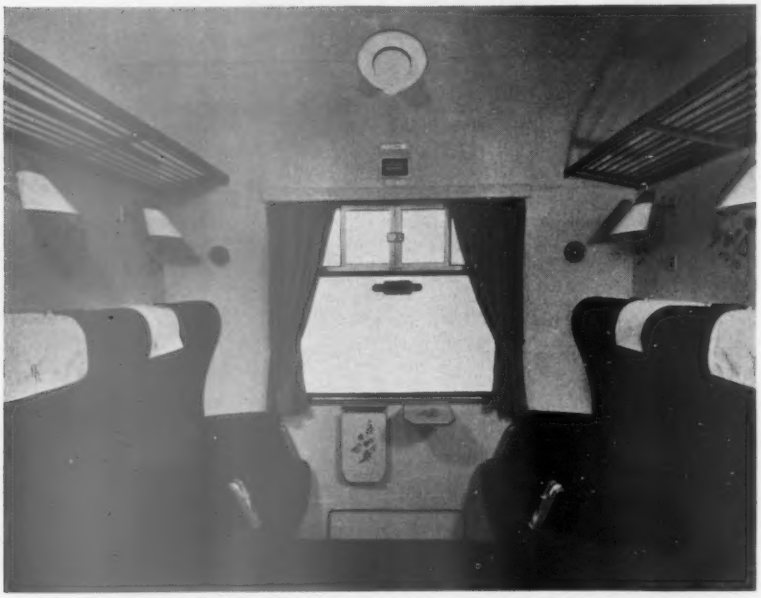
DURING the period of seven years ending in December, 1962, British Railways expect to put into service under the modernisation plan about 20,000 coaching vehicles of all kinds. These will replace about 25,000 existing vehicles, including the whole of the remaining 14,000 wooden-bodied coaches. The 20,000 new vehicles will include about 7,700 main-line coaches fitted with end-gangways, and suitable for haulage by steam, diesel, or electric locomotives.



British Railways first class prototype coach built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd.



Elevation of first class coach, and plan of first and second class coach, showing the respective layouts



Interior of first class compartment, showing layout and seating

In evolving this big fleet of new main line coaches, British Railways in collaboration with manufacturers are seeking to obtain public reaction to such developments as improved heat- and sound-insulation; revolving and reclining seats; heating in corridors; roomier compartments; and a wide range of new designs of luggage racks, lighting fixtures and other equipment. With the object of trying out these various features, the British Transport Commission authorised a programme of 14 prototype main-line passenger coaches, eight to be built by contractors and six in British Railways workshops; the stock will go into service during 1957.

Interior Design

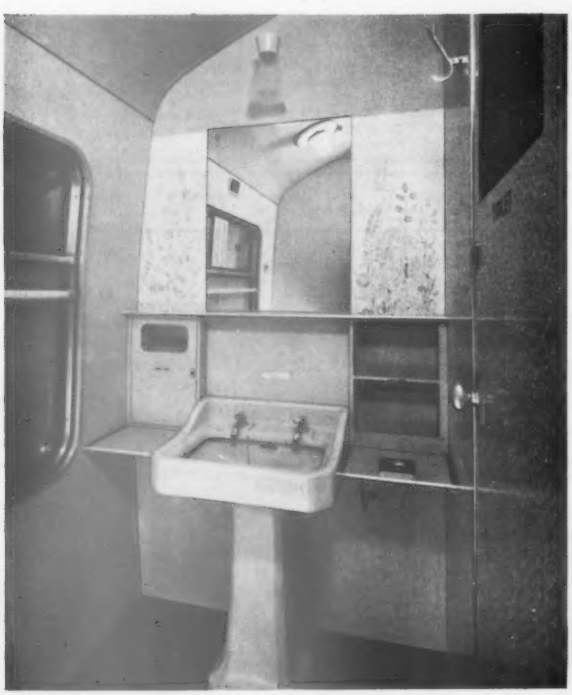
In the interior design and decor of these prototype vehicles, the contractors have been given a free hand to use their own ideas, or to utilise the services of independent design consultants, within the physical limits of the standard British Railways all-steel frame and body. The vehicles now nearing completion at Doncaster, however, will have interior layout, design and equipment based on a special study of future design by a panel of B.T.C. and British Railways experts, with detailed decor commissioned from a design group. These vehicles, one of which will include revolving and reclining seats, anti-sun glass windows, and other features, represent a range of developments from which final selection will be made on the basis of public reaction and practical experience under service conditions.

The first prototype main-line coaches have been completed and consist of one corridor first, and one corridor second built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd.; the prototype restaurant cars were placed in service in July last year.

Basic Standard Dimensions

Although the Metropolitan-Cammell Carriage & Wagon Co. Ltd. were given a free hand on producing a design of modern conception, and decor, basic dimensions were to be to British Railways standard, to include bogies, underframes, and body shell, with a maximum width of 9 ft. They were also to be designed to withstand an end loading of 200 tons. Instructions to proceed with the work were received by the builders on December 22, 1955, with delivery within 12 months.

The total number of passengers to be carried was not laid down but Metropoli-



Ladies powder room, first class coach

First class corridor, showing plastic panelling

tan-Cammell would have, within the above stipulations, a free hand to put forward their own ideas for seating, lighting, heating and general interior finish and decoration. A number of new ideas have been incorporated all of which are designed to increase the comfort of the passenger. For instance, there are six compartments instead of seven in the first class coach, and seven instead of eight compartments in the second class coach, thus giving increased space in each compartment and more leg room for each passenger. Both shells have been sprayed with Limpet asbestos to deaden noise and increase insulation properties. Double glazed window units have also been incorporated with the same object in view, at the same time helping to avoid condensation.

The interior finish is of plastic throughout which will give maximum wear with the minimum amount of maintenance. This type of finish will ensure cleanliness, and mouldings have been kept to the minimum. In the first class coach a special heating arrangement has been fitted to provide a blanket of warm air between the cold surface of the window and the passenger. This arrangement also acts as a demister. In both coaches, however, there is heating along the corridor, broken only at the central doorway. In the first class coach, individual high-back armchair seats have been provided with a new type of upholstery. Each seat also has a Terylene head cover. The seats in the second class coach are of all-aluminium construction to give maximum strength with minimum weight. They are fitted with hinged arm rests and a modern type of upholstery, the seat covers being designed for easy removal for cleaning purposes.

One reading lamp is provided for each passenger seat in both the first and second class coaches, with contemporary style shades, and a more efficient lighting system has been provided throughout, together with a greater power of light. The luggage racks are of tubular design, and decorative panels in plastic appear above the seats on either side, these being incorporated in the Formica veneers. In the first class coach two individual collapsible and plastic-topped tables per compartment are provided at the windows for drinks, and so on, whereas in the second class coach a wider fixed shelf than normal has been provided for this purpose.

There are separate lavatories for ladies and gentlemen and the provision of a special powder room for ladies is an entirely new feature. Decorative panels in plastic appear here as well as in the compartments. There is also increased ventilation in the lavatories, with special extractor fans. There is a higher ceiling than usual. Another feature is the installation of an electric indicator system at the end of the corridor to indicate when the lavatories are engaged. The following is a list of sub-contractors who supplied materials for the new stock.

Sprayed Limpet asbestos	J. W. Roberts Limited.
Window & ventilator units	Hallam, Sleigh & Cheston Limited
Double glazing	Pilkington Bros. Ltd.
Side door droplights	Becket, Laycock & Watkinson Limited
Interior plastic panelling	Thomas De la Rue & Co. Ltd.
Mural designs and colour scheme	Courtney Jaques
First class seating	Pel Limited
First class seating and curtain material	Edinburgh Weavers
Second class seating material	British Replin Limited
Seat interior cushions	Dunlop Rubber Co. Ltd.
Electric light fittings	A.E.I. Lamp & Lighting Co. Ltd.
Toilet fittings	Twyford Limited
Floor coverings	Linoleum Manufacturing Co. Ltd.
First class carpets	T. F. Firth & Sons Ltd.
Parcel racks	Birmingham Guild Ltd.
Aluminium anodise finish	Anotints Limited

The tare weights of the first and second class coaches is 35 tons 12 cwt. 1 qr. and 34 tons 5 cwt. 2 qr. respectively.

Track Loading Fundamentals—3

(*Concluded from page* 160)

benefit. Reducing sleeper spacing helps, but not in direct proportion.

The effect of sleeper spacing at a rail joint might now be examined. The moment of inertia of a pair of fishplates is generally about one-quarter to one-third that of the parent rail. It follows that if normal sleeper spacing is say 30 in. the spacing at the rail joint should not exceed

$$30 \sqrt[4]{\frac{1}{4}} = 21 \text{ in.} \quad \ldots\ldots\ldots (88)$$

Comparing this value with that computed in equation 52 shows that rail-seat load rather than flexural stress in the fishplates determines sleeper spacing at a rail joint, i.e., stiffness rather than strength of fishplates is the criterion determining sleeper spacing at rail joints.

In practice all rail joints are either of the supported or suspended type. In the supported type there is a sleeper under the joint, but the modern view is that a rail joint should not be too stiff as it results in excessive rail batter, and a certain degree of flexibility is desirable. Accordingly, the tendency is to adopt suspended joints, with close sleeper spacing at joints, but not too close, so that a certain degree of flexibility results and sufficient space exists between the joint sleepers to permit fettling.

With track sleeper spacing about 30 in., the load of a single wheel is distributed over 7 sleepers and that carried by the sleeper immediately under the wheel is about 0·4 P. If a close-spaced wheelbase is considered, the Zimmermann load at unrestricted speed is say 0·9 P. The area at the base of the ballast pyramid on the roadbed would be say 150 d, and if the allowable average bearing pressure on the roadbed is not to exceed 12 p.s.i. then

$$d = \frac{0{\cdot}9\ P}{150 \times 12} \quad \ldots\ldots\ldots (89)$$

$$= \frac{P}{2{,}000} \text{ in.} \quad \ldots\ldots\ldots (90)$$

If speed is restricted to 50 m.p.h., the Zimmermann load would be say 0·8 P, when

$$d = \frac{P}{2{,}240} \text{ in.} \quad \ldots\ldots\ldots (91)$$

Although empirical formulæ, they have a rational basis, and it is suggested they can be used as a rough check on the values computed by the more complicated formulæ based on the elastic theory.

It will be noted that the ballast depth required is expressed in inches as: (*a*) at unrestricted speed as the load in U.S. tons of the heaviest wheel in a close-spaced wheelbase; and (*b*) at speeds up to about 50 m.p.h. as the load in Imperial tons of the heaviest wheel in a close-spaced wheelbase; and can be taken as a basis in determining ballast requirements to provide for any vehicle likely to be placed in service.

Before leaving the chapter on the determination of ballast depth required, reference should be made to the study of soil mechanics, since the depth of ballast required is fundamentally dependent on the safe bearing pressure of the soil of the roadbed. To determine this tests must be made of the porosity, density and water content of the soil, and tests to determine its properties such as shear strength, compaction and bearing ratio, before an engineer is able to determine the safe loading a soil will withstand. To increase carrying capacity it may be necessary to change the properties of the roadbed soil by geotechnical processes, such as superficial or deep compaction, the use of stabilising agents or injection processes. The subject is too extensive to be dealt with here, other than to draw attention to the need for such investigations.

Roadbed soils having a safe bearing pressure of 20 p.s.i. (allowable pressure of 12 p.s.i. for track roadbeds), would have a modulus of subgrade reaction of 200 to 230 lb. per cu. in, (say 5·5 kgm. per cc.), and a California Bearing Ratio of 12 to 15 per cent. The modulus of subgrade reaction for firm gravel soils may exceed 2,000 lb. per cu. in. The modulus of subgrade reaction depends on many factors and extrapolation of field test results is essentially a matter of judgment on the part of the engineer.

Some soils absorb water as a result of capillary action, when the safe bearing pressure is reduced. If an embankment is formed of such soil, it becomes necessary to provide a capillary break formed by inserting a 3-in. thick layer of coarse sand.

BIBLIOGRAPHY

[1] Report of British Intelligence Objectives Sub-Committee. H.M.S.O., London

(*To be continued*)

London Transport De-Icing Experiments

Sleet tender tests on the western section of Piccadilly Line

De-icing sleet tender attached to a Piccadilly Line car, showing the spring-loaded roller and brushes

A FURTHER development by London Transport in their unceasing endeavours to prevent winter train delays because of conductor rail icing is the use of sleet tenders attached to the front and rear of an empty service train. One prototype tender has already been completed at Acton Works and another is under construction. The two will shortly undergo tests on the western section of the Piccadilly Line.

These tenders will fulfil the function of the present sleet locomotives, of which the traction control equipment, now out of date, would be costly to modernise. Apart from the much lower initial and maintenance costs, the tender has a particular advantage over a locomotive in that no special crew is required.

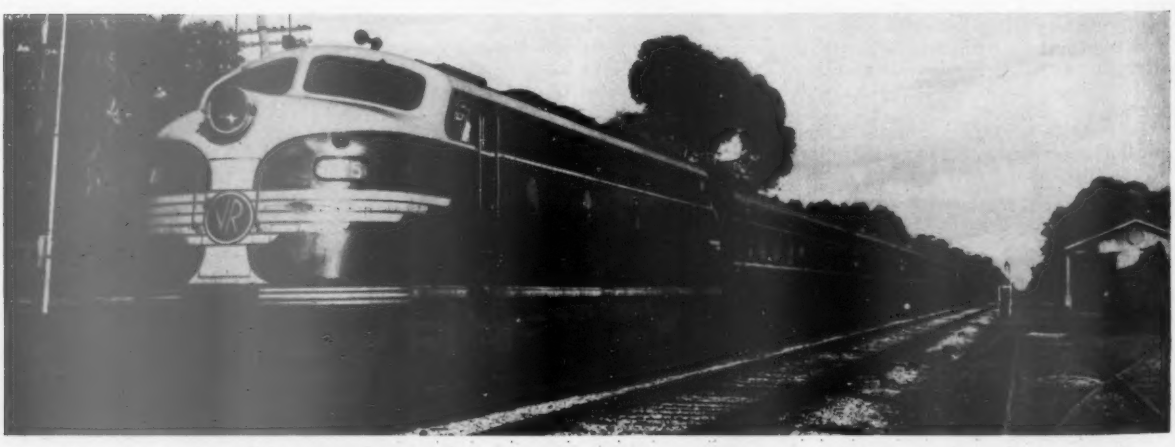
The tender, which is of restricted height to afford an unimpaired view from the train driver's cab, consists of a specially constructed four-wheel bogie, to which is fitted de-icing equipment similar to that of a sleet locomotive, i.e., three sets of crushing rollers, steel brushes and de-icing sprays. One of the three sets deals with the central negative rail, and the other two with the positive rail according to which side of the track it is located.

Method of Operation

Compressed air from the train system is utilised to lower the rollers and brushes, which are raised by spring pressure. The sprays are fed by an axle-driven pump from two inter-connected 75-gal. tanks mounted on top of the bogie frame. Delivery is at the rate of 0·9 gal. of de-icing fluid per mile. The pump is cut out as required by the disengagement of a lever-operated dog clutch. To avoid damage to the pump in the event of all three sprays becoming blocked, the delivery pipe is fitted with a relief valve from which the fluid is returned to the tanks.

As the location of the positive rail varies from side to side of the track, a selector, in the form of a mechanically-operated cut-off valve, is provided on each side. This valve is operated by a lever carrying a small roller which rides on the positive rail. When the roller drops below a pre-detemined level (i.e., at the rail end ramps) the spray on that side is cut off. The tender is fitted with a spring-applied brake, which is normally released by air pressure. Thus, in the unlikely event of a break-away, the brake would be applied automatically. When compressed air is not available, a hand-operated release is used.

Melbourne-Sydney Day Service



The Victorian Railways "Daylight Express" at Longwood, between Melbourne and Albury, where passengers change into the New South Wales Government Railways train for Sydney (*See our January 11 issue*)

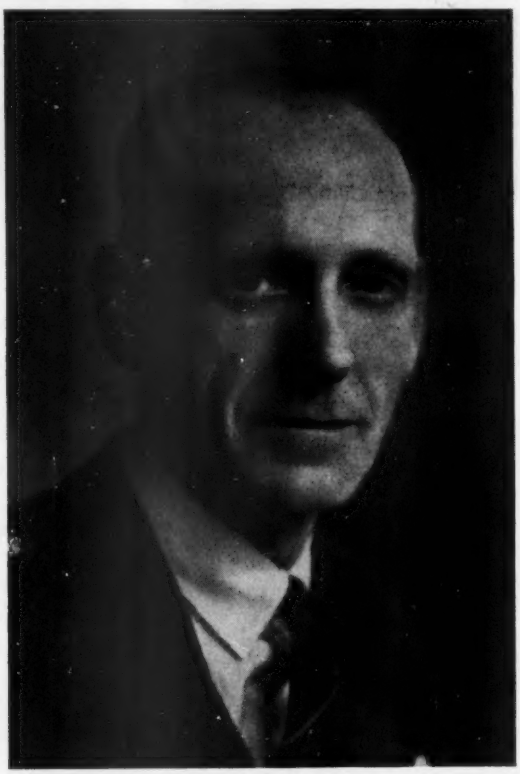
RAILWAY NEWS SECTION

PERSONAL

Mr. V. A. M. Robertson has been elected President of the Smeatonian Society of Civil Engineers for the year 1957.

Mr. F. R. Stockdill, Regional Accountant, Western Region, British Railways, who, as recorded in our January 18 issue, has been appointed Chief General Accountant, Finance Department, B.T.C., entered the service of the L.S.W.R. in 1921, and, after three years in the Locomotive Department, was transferred to the Chief Accountant's Office of the newly-formed Southern Railway. In December, 1940, he was seconded to the Transportation Accounts branch of the Ministry of Supply, and on release from the Ministry in 1943 was appointed Special Assistant to the Chief Accountant, Southern Railway, becoming Assistant Accountant in 1946. Two years later he became Accountant, Southern Region, British Railways. Mr. Stockdill was appointed Accountant, Western Region, British Railways, in September, 1953.

Mr. F. R. Stockdill
Appointed Chief General Accountant, Finance Department, B.T.C.



Mr. J. Gillespie
Appointed Chief Railway Accountant, Finance Department, B.T.C.

We regret to record the death on February 1, at the age of 82, of Sir John Craig, C.B.E., Honorary President of Colvilles Limited. Sir John Craig, who had been associated with that company for nearly 70 years, joined it as an office boy at the age of 13 in 1888. He was also on the boards of a number of other companies, had been President of the National Federation of Iron & Steel Manufacturers and of the Iron & Steel Institute, and for some years was a member of the council of the Federation of British Industries.

Mr. A. P. Evans, Deputy Chief Engineer (Mechanical), Crown Agents for Oversea Governments & Administrations, has left this country to pay a short visit to islands and territories in the Caribbean area as to which the Crown Agents have responsibilities.

Mr. Christian Johnston has been confirmed in the appointment of Hotels Controller of the Ulster Transport Authority as from the beginning of last month. He will continue as Hotels & Catering Manager of the Great Northern Railway Board.

Mr. R. G. Roberts has been appointed Traffic Manager of the City of Oxford Motor Services Limited, succeeding the late Mr. J. M. D. Scott.

Mr. I. R. Patey, Secretary & Assistant General Manager, Crosville Motor Services Limited, has been appointed General Manager and a Director of the Bristol Tramways & Carriage Co. Ltd., with effect from March 1, 1957, succeeding Mr. J. C. Dean.

Mr. W. A. H. Watts, Managing Director of the P. & M. Co. (England) Ltd., is on a business tour of the Far East. During his tour he will show the company's film "Carefree Curves," to which editorial reference was made in our January 25 issue.

Mr. J. Gillespie, Director of Accounts, British Transport Commission, who, as recorded in our January 18 issue, has been appointed Chief Railway Accountant, Finance Department, B.T.C., began his career with the Caledonian Railway at St. Rollox Workshops in 1918. After gaining clerical experience in various departments he entered the Locomotive Accountant's Office, Glasgow, and, in 1929, was appointed to take charge of the Accounts Sub-Section dealing with new works, expenditure, and statistics. In 1942 he was transferred on loan to the Ministry of War Transport and appointed Investigating Officer in connection with the examination of the control (net) revenue account of the L.N.E.R. During 1945-46 he was closely identified with the programme of rolling-stock renewals for all the railway companies and acted on behalf of the Ministry as examiner of contracts placed with private builders. In September, 1946, he returned to the L.M.S.R. as Works Accountant, Glasgow, and took up the appointment of Assistant Accountant, British Railways, Scottish Region, in October, 1948. In January, 1951, Mr. Gillespie was appointed Assistant (Expenditure Matters) to the Chief Financial Officer, Railway Executive and, in July, 1954, Director of Accounts, British Transport Commission.

Mr. H. B. Elliott, Service Manager of A.C.V. Sales Limited, has left this country for a comprehensive business tour of Australia and New Zealand.

Mr. F. A. Dadge

Appointed Assistant Railway Accountant, Finance Department, B.T.C.

Mr. E. W. Bratchell

Appointed Revenue Accountant (Railways), Finance Department, B.T.C.

Mr. H. R. Hill

Appointed Treasurer, Finance Department, British Transport Commission

Mr. F. A. Dadge, Assistant Director of Accounts, British Transport Commission, who, as recorded in our January 18 issue, has been appointed Assistant Railway Accountant, Finance Department, B.T.C., began his career with the Great Western Railway in 1924 in the Chief Accountant's Office at Paddington. After gaining experience in various sections he transferred in 1935 to the Audit Office, Swindon, where he was engaged in special work in connection with the Government Control Agreement from 1940 to 1946 when he became Chief of the Audit Section, Swindon Works. He transferred to Paddington in 1949 as Head of the Ledger Section and became Assistant to the Chief Accountant in 1950, Senior Assistant in 1951, and Assistant Accountant in 1952. In 1954 he was appointed Assistant Director of Accounts, British Transport Commission. Mr. Dadge is an Associate Member of the Society of Commercial Accountants, a former chairman of the Accountant's General Expenditure Sub-Committee, and a member of various other accounting committees. In 1955 Mr. Dadge was nominated by the Chief Regional Managers as a member of a team which carried out an investigation of the Rhodesian railways.

Mr. J. R. Hammond has been appointed Assistant to the General Manager (Modernisation), Western Region, British Railways.

Mr. R. C. Perris has been appointed Assistant District Commercial Manager, York, North Eastern Region, British Railways.

Mr. D. S. Hart has been appointed District Passenger Manager, Birmingham Area, London Midland & Western Regions, British Railways.

Mr. Albert E. Youd, Senior Passenger Service Clerk in the Chief Operating Superintendent's office, Euston, London Midland Region, British Railways, has retired after 45 years of service with that Region. During the last four years he has arranged over 100 Royal train journeys. Mr. Youd's last "Royal" was for the Queen's journey to and from Euston when she opened the Atomic Power Station at Sellafield.

Mr. E. W. Bratchell, Assistant Director of Budgets (Traffic Revenue), Finance Department, British Transport Commission, who, as recorded in our January 18 issue, has been appointed Revenue Accountant (Railways), B.T.C., began his career in the Audit Office of the Great Western Railway in 1908. He remained there until 1952, except during 1914-20, when he served with the Royal Fusiliers and the Queen's Royal West Surrey Regiment, and with the Army of occupation in Europe. He progressed through the various departments of the Audit Office to become Audit Accountant in 1947, and, in 1952, was appointed Revenue Assistant to the Chief Financial Officer, Railway Executive. Mr. Bratchell became Assistant Director of Budgets (Revenue matters), Department of Accounts & Finance, British Transport Commission, in 1954.

Consequent on the retirement of Mr. L. Bicheno, Divisional Engineer, Central Road Services, South West Division, the following appointments are announced by the London Transport Executive:—

Divisional Engineer, Central Road Services, South West Division

Mr. A. E. Butler, Divisional Engineer, Central Road Services, will transfer from the South East to the South West Division.

Divisional Engineer, Central Road Services, South East Division

Mr. W. I. Kirshner, Divisional Engineer, Country Buses & Coaches, South Division, has been appointed Divisional Engineer, Central Road Services, South East Division, and becomes an Officer on the Executive. Mr. Kirshner, who is 60, entered the service of West London Coaches in May, 1925, and, when that undertaking was acquired by the London Passenger Transport Board in 1934. was transferred to the service of the Board, He served as District Engineer in the Country Area until his appointment as Sub-Divisional Engineer (Southern Area) in 1948. He became Divisional Engineer, Country Buses & Coaches, South Division, in 1949.

Divisional Engineer (General)

The position of Assistant Rolling Stock Engineer has been abolished and a new headquarters position created, with the title Divisional Engineer (General). Mr. R. D. Gillanders, A.M.I.Mech.E., has been appointed Division Engineer (General) and becomes an Officer of the Executive. Mr. Gillanders, who is 42, entered the service of the London County Council as an apprentice in 1930. He was appointed Assistant to the Divisional Engineer, Trams & Trolleybuses (South) in 1946, and Assistant Divisional Engineer "B" Division, Central Buses, in 1948, becoming Administrative Assistant to the Rolling Stock Engineer (Road Services) in April, 1956.

Mr. H. R. Hill, A.C.I.S., A.I.B., Senior Assistant, Funds Division, Finance Department, British Transport Commission, who, as recorded in our January 18 issue, has been appointed Treasurer, British Transport Commission, was educated at Bancroft's School and King's College, University of London. He obtained a wide experience of finance with Messrs. Glyn, Mills & Company, the railway bankers, with which organisation, after acting successively as assistant to the Secretary and to the Chief Accountant, he became senior officer of the Advance Department. Subsequently, for seven years, he was Acting Secretary of the Bank and of the Bank's trustee companies, with responsibility for the control and management of bank investments, the oversight of debenture trusteeships and of capital market matters, publicity, advertising and costings. In 1946 he was appointed Chairman of the Moorend Park Hotel Co. Ltd. Mr. Hill joined the service of the British Transport Commission in 1948 to assist the Director of Funds in the control of the large investment portfolio vested in the Commission at nationalisation and in the employment of liquid funds and banking matters generally.

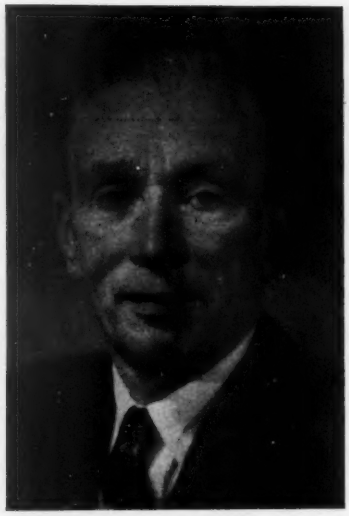
Mr. G. H. K. Lund, Assistant (Motive Power), Operating & Motive Power Department, British Railways Central Staff, who, as recorded in our January 4 issue, has been appointed Work Study Assistant, B.T.C., was educated at Bedford School and became a premium apprentice with the L.N.E.R. under Sir Nigel Gresley in 1929. He attended the Technical College, Darlington, and was awarded the Chief Mechanical Engineer's scholarship at King's College London. After experience in the Electrical Department of the L.N.E.R. he worked in the Testing Department and Dynamometer Car and, in 1934 was transferred to the

Mr. E. P. J. Lunch

Assumes additional responsibilities as Assistant Director of Statistics, Finance Department, B.T.C.

Mr. S. J. Birch

Appointed Assistant Director of Accounts, Finance Department, B.T.C.



Mr. D. R. Fraser

Appointed Budget Accountant (Railways), Finance Department, B.T.C.

Locomotive Running Department as Supernumerary Foreman at Hull, where he had experience with steam and diesel railcars. In 1935 he went to Middlesbrough as Junior Inspector and was given special duties in connection with the supervision of the railcars and diesel units; then, after a period at Leeds Neville Hill, he became District Technical Inspector at Newcastle in 1939. Mr. Lund was appointed Shedmaster, Hawick, in 1940 and after periods at Bathgate and Parkhead, he became Technical Inspector & Personal Assistant to Locomotive Running Superintendent. In 1944 he was appointed Shedmaster, Haymarket, Edinburgh; in 1947, Shedmaster, Eastfield, Glasgow, and, after nationalisation, Assistant District Motive Power Superintendent at Aberdeen. He returned to Edinburgh as Assistant District Motive Power Superintendent in 1954, becoming the following year Assistant (Motive Power), British Railways Central Staff, the position he now vacates.

Mr. E. P. J. Lunch, Secretary, Area Management Costs & Statistics Panel Secretariat, Statistics Division, British Transport Commission, who, as recorded in our January 18 issue, assumes additional responsibilities as Assistant Director of Statistics, Finance Department, B.T.C., is a chartered accountant. Before joining the Acquisitions Division of the B.T.C. in 1948 he was with Messrs. Price, Waterhouse & Company and, subsequently, in private business management. He was a director of H. & G. Dutfield (B.T.C.) Limited until that group was absorbed into British Road Services. In 1953 he was appointed Senior Traffic Costing Officer and he became Secretary of the Area Management Costs & Statistics Panel in 1955, an interest he still retains. Mr. Lunch is a member of the B.T.C. Advisory Panel on Electronic Computing & Control Devices. Since 1954 he has represented British Railways on the Costs Sub-Committee of the International Union of Railways. He is an R.N.V.R. executive officer.

Mr. T. Lowe, Assistant (Technical & Maintenance Staff), B.T.C. Headquarters, has been appointed Staff Assistant, Chief Mechanical & Electrical Engineer's Department, Brighton, Southern Region, British Railways, vice Mr. W. G. Ducker, who is retiring on May 31.

Mr. S. J. Birch, Senior Taxation Assistant, Accounts Division, British Transport Commission, who, as recorded in our January 18 issue, has been appointed Assistant Director of Accounts, Finance Department, B.T.C., began his career with the London General Omnibus Co. Ltd. in 1925. With the formation of the London Passenger Transport Board in 1933, he became engaged on the initial stages of the taxation work of that body and, from 1939, was responsible for its assessments. In 1949 he transferred to the British Transport Commission where, as Senior Taxation Assistant, he had the task of completing the taxation assessments of the vested undertakings and setting up the organisation of the Commission's computations.

Mr. D. R. Fraser, Senior Budgets Assistant, British Transport Commission, who, as recorded in our January 18 issue, has been appointed Budget Accountant (Railways), B.T.C., was educated at Dingwall Academy. He began his career in 1914 with the Highland Railway at Inverness. In 1927 he was appointed head of the manufacturing section in the Accountant's office at Crewe and subsequently re-organised the costing system in that office. The revised method is now standard practice. On appointment in 1930 as Works Accountant at Horwich he mechanised costing and accounting and introduced budgetary control. Lord Stamp appointed him in 1938 to take charge of the independent section at Euston, responsible direct to the President for back-checking, as established by Sir William Wood, of the financial results obtained from new works schemes. Mr. Fraser vacated this position in 1950 on appointment as Assistant (budgetary and other matters) to the Chief Financial Officer of the Railway Executive, and has been responsible for the development of works and equipment and revenue budget procedures.

Mr. P. Spilsbury has been appointed General Agent for the Canadian Pacific Railway in Manchester with effect from February 1. He succeeds Mr. R. L. Hughes, who retired on January 31 after 44 years of service. Mr. Harry McBride, the company's Freight Agent in Liverpool, succeeds Mr. Spilsbury as General Agent, Bristol.

Sir Hugh Beaver has resigned from the Council for Scientific & Industrial Research following his appointment as Deputy President of the Federation of British Industries.

Mr. J. G. Whetton, District Traffic Manager, Auckland, New Zealand Railways, who, as recorded in our February 1 issue, is retiring, began his railway career in 1917 as a cadet at Wellington. He later gained experience at stations in the Wanganui, Hawkes Bay, and Main Trunk areas. In 1936 Mr. Whetton was transferred to the General Manager's office at Wellington, where he was subsequently promoted to be Information Officer. In 1944, after two years as Stationmaster at Waipawa, he became Chief Clerk at Napier and, a few months later, took up the position of Stationmaster at Paekakariki. Promotion as Assistant Stationmaster at Auckland came in 1946, and was followed a year later by appointment as Assistant Traffic Manager at Ohakune. From there Mr. Whetton returned to Auckland as Goods Agent, and, in 1951, he became District Traffic Manager at Wellington. He was appointed District Traffic Manager, Auckland, in 1952.

Mr. A. W. Egan, who, as recorded in our February 1 issue, has been appointed District Traffic Manager, Auckland, New Zealand Railways, joined the system in 1923 as a cadet at Christchurch. He later served at various stations in Otago and Canterbury, and, in 1944, was transferred to the Train Control office at Dunedin. Three years later Mr. Egan was appointed Train Running officer, in which capacity he served first at Dunedin and later at Wellington. In 1953 he was transferred from the District Traffic Manager's office to the Transportation Superintendent's office, where, a year later, he was promoted to be Senior Train Running Officer. When a Traffic Office was established at Frankton toward the end of 1955 he was selected for appointment to the position of Traffic Manager. In this position he was responsible for administering Traffic Branch affairs in the Waikato, Rotorua, and Bay of Plenty areas on behalf of the District Traffic Manager at Auckland. During the 1953-54 Royal Tour, Mr. Egan rendered valuable service as the Railways Depart-

ment liaison officer, and at the conclusion of the tour he was presented by the Queen with a handsome pair of embossed gold cuff links. Mr. Egan was actively engaged in the planning of the Hutt Valley electrification project, and played a leading role in the emergency operations resulting from the Tangiwai accident. In addition to his exacting Royal Tour duties during this period, he acted as Secretary for the Tangiwai Emergency Committee which was presided over by the Prime Minister, the Rt. Hon. S. G. Holland.

Mr. K. D. Croft, District Traffic Manager at Wellington, New Zealand Railways, who, as recorded in our February 1 issue, is retiring, joined the system in 1917 as a cadet at Christchurch. He later served in the staff division of the General Manager's office at Wellington, and was transferred to the Auckland district in 1933. During the 1939-45 war, Mr. Croft was appointed organiser of the railway emergency precautions scheme in the Auckland district. In 1944 he became an audit inspector in the Chief Accountant's office and, five years later, returned to Auckland, where he was engaged on special duties in the District Traffic Manager's office. He was appointed District Traffic Manager, Wellington, in 1954. In private life Mr. Croft is keenly interested in Rugby football, and has been actively associated with the sport as a referee in the Hawkes Bay, Waikato, and Auckland district. For three years he was a member of the Referees' Appointment Board of the Auckland Rugby Union.

Mr. S. Smith, who, as recorded in our February 1 issue, has been appointed District Traffic Manager, Wellington, New Zealand Railway, began his railway service in 1921 as a cadet at Wanganui. After considerable experience at stations in the Wanganui area he was transferred to the Department's training school at Wellington, where he acted as a tutor for a period of two years. In 1937 Mr. Smith entered the Commercial Branch, and during the war was attached to the District Traffic Manager's office, Wellington, where he carried out claims, season ticket, and transport licensing duties. On his return to the Commercial Branch in 1946, Mr. Smith was promoted to be Senior Clerk. A year later he became Rates Clerk (later Rates Officer), and, in 1953, Assistant Commercial Manager. Mr. Smith's private interests include tennis. He was a foundation member and first Secretary of the Naenae (Lower Hutt) Tennis Club, and today holds life membership.

Mr. Allen L. Sams has been appointed Principal Assistant Engineer, and Mr. T. Dabney Kern, Office Engineer, of the Illinois Central Railroad.

Mr. A. S. Mountfield, Deputy General Manager & Secretary of the Mersey Docks & Harbour Board, will succeed Mr. F. H. Cave when he retires as General Manager & Secretary on March 17.

The Rt. Hon. Sir Percy H. Mills, Bt., K.B.E., has resigned as a Director and as Chairman of Lancashire Dynamo Holdings Limited on his appointment as Minister of Power. Mr. S. F. Steward, the Group Managing Director, has succeeded Sir Percy Mills as Chairman.

Mr. C. F. Barnard, M.I.Mar.E., M.I.E.E., Managing Director of Mirrlees, Bickerton & Day Limited, has been appointed to the board of the Brush Group. He has also been appointed Executive Vice-Chairman of Mirrlees, Bickerton & Day Limited, Executive Vice-Chairman of the National Gas & Oil Engine Co. Ltd., and of J. & H. McLaren Limited, and Deputy Chairman of Associated British Oil Engines Marine (Mirrlees) Limited and Associated British Oil Engines Marine (National) Limited. He will also retain a seat on the board of Brush Traction Limited.

Sir Godfrey Ince has been elected a director of the Dowty Group.

Mr. Charles T. Alderson has been appointed a director of Ruston & Hornsby Limited.

Mr. G. C. Mott, Financial Controller of Philips Electrical Limited, has been appointed a director of the company with effect from January 1, 1957.

Mr. Richard Lorimer Watt, Planning Director of Mirrlees, Bickerton & Day Limited, has been appointed Director & General Manager of that company.

Mr. F. A. M. Oldham, Chief Engineer, and Mr. Peter B. Cheston, Sales Executive, have been appointed to the board of Hallam, Sleigh & Cheston Limited.

Mr. S. A. Mousley, General Sales Manager of the General Rubber Goods Division in Manchester of the Dunlop Rubber Co. Ltd., has been appointed General Manager of the company's Belting Division with headquarters at Speke.

Mr. Sidney E. Veale has been appointed Press Officer, D. Napier & Son Limited. Mr. Veale, who joins Napier from Folland Aircraft Limited, succeeds Mr. T. Lacey, who left recently to join the Fairey Aviation Co. Ltd.

The Automatic Telephone & Electric Co. Ltd. announces that Sir Alexander Roger has retired from the board with effect from December 31, 1956, and has accepted the appointment of Honorary President of the company. Mr. C. O. Boyse has been appointed Managing Director.

Mr. A. Lucas, who has been responsible since 1946 for the design, layout, and construction of stands for the Dunlop Rubber Co. Ltd. at the Motor and Commercial Vehicles Shows, has retired from the position of Exhibition Manager to the Company.

Dr. W. I. Pumphrey, Research Manager of Murex Welding Processes Limited, has been awarded the degree of D.Sc. in Industrial Metallurgy by the University of Birmingham for his work on hardenability, the transformation of steel during continuous cooling, and the metallurgy of welding.

Mr. V. S. Risoe, M.B.E., was appointed to the board of Associated Electrical Industries Overseas Limited at the beginning of last month and has resigned from the boards of Associated Electrical Industries (India) Private Limited and Associated Electrical Industries Manufacturing Co. Private Ltd.

Black & Decker Limited announces the following appointments: Mr. Leo Long, European Sales Manager; Mr. Ken Gahagan, Mid-African Representative; Mr. Bill Downing, Region Sales Manager (Utility) for the London & Eastern Region of England.

Mr. C. B. Nixon, Chairman of the Leyland Motors Group since 1942, has retired as from January 1. He is succeeded by Sir Henry Spurrier, who retains the office of Managing Director. Mr. Nixon, who is 80, retains his seat on the board. Mr. Walter West has been appointed Deputy Chairman of Leyland Motors Limited.

Lord Bicester has been elected a director of Associated Electrical Industries Limited.

Admiral Sir William G. Andrewes has been appointed to the board of John I. Thornycroft & Co. Ltd.

Mr. Roland Hall has been appointed Assistant Staff Manager, succeeding Mr. P. S. Welham, who becomes Staff Manager, Thos. Cook & Son Ltd.

Mr. R. A. Grierson has been appointed Manager of the Transformer Division of the Brush Electrical Engineering Co. Ltd.

Mr. Frank Clark has been appointed Manager of the Sales Technical Service Department of British Oxygen Gases Limited.

Major-General R. E. Urquhart has been appointed a director of Duncan Stewart & Co. Ltd., the Glasgow subsidiary of Davy & United Engineering Co. Ltd.

Mr. Arthur Chamberlain has resigned from the board of Tube Investments Limited and from his appointments with the subsidiary companies of that group.

Mr. J. M. E. Fell, Director-Export, A.C.V. Sales Limited, has left this country by air on a world tour. Before he returns to Britain next summer Mr. Fell will have visited the Far East, Australia and New Zealand, and North America.

Mr. C. T. Alderson, Commercial Manager of Ruston & Hornsby Limited, has been appointed to the board of that company. Mr. Alderson is a grandson of Sir George Alderson, the organisation's first overseas agent.

Mr. Austin H. George, Service Manager of the original equipment division of the Dunlop Rubber Co. Ltd., has left by air for New York. He will spend from three to six months investigating and extending the servicing arrangements for Dunlop components on British motor vehicles exported to the U.S.A.

At a meeting of the Irish Railway Clearing House Committee held on January 31, Mr. T. C. Courtney was unanimously elected Chairman for the year 1957.

Mr. J. D. Pearson has taken over from Lord Hives as Chief Executive of Rolls-Royce Limited, who has reached the age of 70. Mr. Pearson, who is 48, joined the company in 1932. He and Mr. Whitney Straight, former Deputy Chairman of B.O.A.C., become Deputy Chairmen of the board, and Lord Kindersley, a member of the Court of the Bank of England, succeeds Lord Hives as Chairman of Rolls-Royce Limited.

The following appointments have been announced by the British Oxygen Co. Ltd.: Mr. A. W. Stones to be Manager, Western District, British Oxygen Gases Limited, succeeding Mr. J. E. Clark, who takes up an appointment with British Oxygen Wimpey Limited, a company formed recently for the construction of special rocket projects; Mr H. J. Vise to be Superintendent, Photographic Section, and Mr. L. B. Smith Superintendent, General Service Section, of the Sales Technical Department of British Oxygen Gases Limited.

Centenary of Birth of G. J. Churchward

The centenary of the birth of the late George Jackson Churchward, who from 1902 to 1921 was Chief Mechanical Engineer of the Great Western Railway, was marked on January 31, by a wreath being laid on his grave at Christ Church, Swindon.

The wreath, designed to include the outline of a locomotive and the initials "G.J.C.," was laid on the grave by Mr. C. L. Godsell, a 68-year-old fitter in the Erecting Shop in Swindon Locomotive Works, who was an apprentice in Mr. Churchward's time and was personally known to and by him.

The ceremony was conducted by Canon F. W. Thomas. Amongst those present were the Mayor of Swindon; Mr. R. A. Smeddle, Chief Mechanical & Electrical Engineer; Mr. C. T. Roberts, Carriage & Wagon Engineer; and Mr. F. W. Hawksworth, former Chief Mechanical Engineer, Western Region.

Churchward's life and achievements are referred to in an editorial article on another page.

Improvement in London Bus Operation

Despite the fact that many more people are travelling, London buses are now running better than they have done for years. This has happened because of the freer street conditions brought about by petrol rationing. This was stated by Sir John Elliot, Chairman of London Transport, at a press conference on February 1. Delays and irregularities have disappeared, buses arrive on time and times taken to cross Central London by bus have been cut down.

It has been proved beyond all doubt, he claimed, that with a big reduction in street parking and "a reasonable let-up" in general congestion, London buses can run 100 per cent better, and give London the first-class road service it ought to have. It has also been shown that London Transport can handle without difficulty as many motorists as want to transfer to its services. Even with the extra crowds being carried on an emergency basis, services are quicker, more regular, and evenly spaced, so that the vast bulk of people are getting to and from work more quickly, and short rides can be made with ease.

"The public and the authorities," he said, "will have to decide whether they want to keep this improvement after the end of petrol rationing—remembering that we could do still better on a permanent basis—or whether they will accept a return to the old street jams with chaotic disorganisation of bus services. That is the problem Londoners have to face."

Quicker Journeys

Journeys through the West End and City have been shortened by anything from eight to 18 min. Even these savings in time are less important than the benefits from bus regularity.

"At a busy stop in Oxford Street where we planned to have 50 buses arriving during the vital half-hour 5.30-6 p.m.," he explained, "we would often have only 25 of them turning up within that time, the rest being "lost in the traffic." But now all 50 are coming up on time. They are lifting all the passengers. In that way freer streets are in many cases making rush-hour services 100 per cent more effective."

London Transport formerly had to cancel 50,000 miles a week of rush-hour bus services because drivers could not get through the traffic in time. Now no buses are being cancelled for traffic reasons and the full service is being run. Waits at key points have been cut down and London Transport is able to get people on the buses quicker, give them a service at regular intervals, offer them more room and carry them more quickly to their destinations. Drivers have been told to run at a "good even speed" with special attention to intervals between the buses. The inspectors are giving their whole attention to this problem of getting an even speed and if buses get ahead of time, they are sending them on to their destination without slow running.

"There will always be rush-hour congestion while a third of Central London workers knock off simultaneously at one time—5.30 p.m., and pack themselves into our trains and buses," he said. It would be "a stupendous piece of folly" if the biggest real improvement in travel conditions since the war were thrown away. "As Chairman of London Transport Executive, I speak for 9,000,000 bus riders a day, so it is not some private grievance of London Transport's. If Londoners know what is good for them they will support our efforts to focus attention on this problem before it is too late."

BRITISH PLASTICS EXHIBITION & CONVENTION.—The International British Plastics Exhibition & Convention will be held at Olympia, Kensington, London, W.14, on July 10-20, 1957. It is anticipated that at least eight countries, including the U.S.A., will exhibit various products.

TESTS FOR WELDERS.—British Standard 2645, Part 2, issued by the British Standards Institution, deals with mild steel and low alloy pipelines and pipe assemblies, and is a comparison standard to Part 1, which dealt with mild steel and low alloy steel sheets, plates, and sections. The purpose of these standards is to make available a series of agreed standard tests, one or more of which can be selected for assessing and testing the capabilities of a welder. B.S. 2645, Part 2, covers various thicknesses of tube, normal forms of joints, and various welding positions, and is complementary to B.S. 1295, which gives tests designed to assess progress of trainees. The appendices give notes on alternative sizes of electrodes, suggested methods of preparing etched specimens, and the method of preparing and testing bend test specimens. Copies are available from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1.

At the Permanent Way Institution Conversazione

Sir Brian Robertson speaking at the Permanent Way Institution conversazione on January 26; (right) Lt.-Colonel G. R. S. Wilson with Sir John Benstead and Mr. C. P. Hopkins (See last week's issue)

NEW EQUIPMENT AND PROCESSES

Diesel Injector-Nozzle Inspection

AN inspection device for railway traction or road diesel engine maintenance has been produced under the trade name Nozzlescope. It allows inspection of injector-nozzle and needle seats, which by magnification enables a visual examination of the item to be carried out. A decision as to its suitability for repair may then be made.

When viewed through the Nozzlescope, as shown in the illustration, the nozzle and needle seat scoring or other damage is sharply shown up. Illumination is provided by means of a lens bulb supplied by three U2 dry batteries. As an alternative, the bulb may be lit from 220/250-V. a.c. mains supply via a small transformer. The complete instrument (less batteries) including nozzle and viewing assemblies, six adaptors, a transformer and a spare bulb is supplied in a compact wooden case. A bench stand can be supplied as an optional extra.

The price of the Nozzlescope is £13 10s., the stand being an additional £3 10s. Delivery can be made from stock. The manufacturer is Simms Motor Units Limited, East Finchley, N.2.

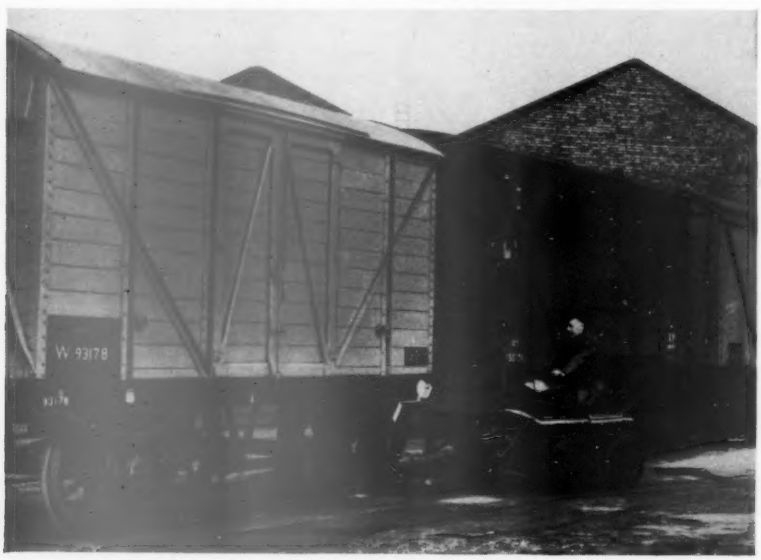
Compact Shunting Tractor

A RANSOMES ITW four-wheel-drive tractor fitted with special shunting equipment is being employed by British Railways at Peterborough East. There are many advantages of a mobile, manœuvrable unit of this type, particularly where the use of a steam or diesel shunting locomotive to move only one or two wagons, as for instance, in a small goods yard, is uneconomical.

The four-wheel drive system gives good wheel adhesion under difficult operating conditions. The tractor is said to be simple to drive and the steering very light. The machine is designed to have a low centre of gravity and balanced weight distribution.

The single cylinder 7-b.h.p. side-valve engine drives the three forward and reverse speeds gearbox through an automatic centrifugal type clutch which is controlled by the flywheel speed. The main drive from the gearbox to a differential and thence to the final drive sprockets is by gear wheels. Steering and braking is controlled by hand levers operating contracting brake bands.

Dimensions of the tractor are: height, 3 ft. 4½ in.; width, 3 ft. 2 in.; length, 6 ft. 8½ in. The weight of the basic tractor is 13 cwt.



The basic price of the ITW is £410; the shunting attachment is an additional £38 10s. The delivery period is said to be reasonable. The manufacturer is Ransomes Sims & Jefferies Limited, Ipswich.

Tangential Spray Gun Nozzle

A DEVELOPMENT in the design of spray gun nozzles which shows savings in air and paint, is known as the Tangential Nozzle, air-pressure spraying being extensively used for painting rolling stock and so on.

The Tangential Nozzle has been developed to obtain the maximum conversion of energy of the air passing through the fan ports to produce the fan spray. In a conventional nozzle this energy is largely dissipated because the air ports are opposed, so that the two air streams strike into each other directly, and most of the energy is lost. By using a tangential arrangement of the nozzle horns, the kinetic energy of the discharged air is used to the full, as the two air streams pass tangentially across the face of the nozzle.

This gives a wide spray and large coverage per pass, while breaking up the paint, with a small consumption of air at a low pressure. Large savings are stated can be shown on certain applications, and it is frequently possible to reduce atomising air pressure from 50 p.s.i. to 5 p.s.i. with improved performance and corresponding savings in air and paint. The Tangential Nozzle is suitable for use with the manufacturer's L.200, L.500 and L.600 Guns.

Details of price and delivery may be obtained on application to the manufacturer, Alfred Bullows & Sons Ltd., Long Street, Walsall, Staffs.

Diesel Injector Tester

THE Injectester is designed to be capable of testing both the injectors and pumps of all slow- and high-speed diesel engines, without removing either item from the engine. It is suitable for diesel locomotive repair depots. It provides diesel users with a quick means of carrying out all the usual tests and of adjusting injectors direct from their own fuel pump, whatever type is employed.

It can also be used to check the crack and buzz of the injector when the fuel pump is primed by hand, and will also provide a satisfactory test for atomisation and the injector release pressure under normal working conditions and speeds.

Costings for servicing diesel equipment may be cut, it is claimed, by up to 75 per cent, and the operation of servicing the fuel pump and injectors can be handled by any mechanic.

The unit is supplied in a steel box, with coupling nuts and pipes to fit both 12 mm. and 14 mm. type injectors and similar size fuel pump connectors, although other adaptors are available as extras. The dimensions of the carrying box are 11 in. × 11 in. × 4 in., and the complete outfit weighs 16 lb.

The price of the Injectestor is £48 and delivery can be made in five weeks. The

manufacturer is the Dunedin Engineering Co. Ltd., 51, Beauchamp Place, London, S.W.3.

Electronic Megaphone

INTENDED for use against background noises, as in a marshalling yard, the Transhailer is a transistored lightweight item of loud-hailing equipment.

The use of transistors not only allows the expected life of one set of batteries to be six months, equivalent, it is said, to 20,000 ten-second messages, but by saving weight cause the Transhailer to be robust and fully portable—weighing with batteries 5 lb.

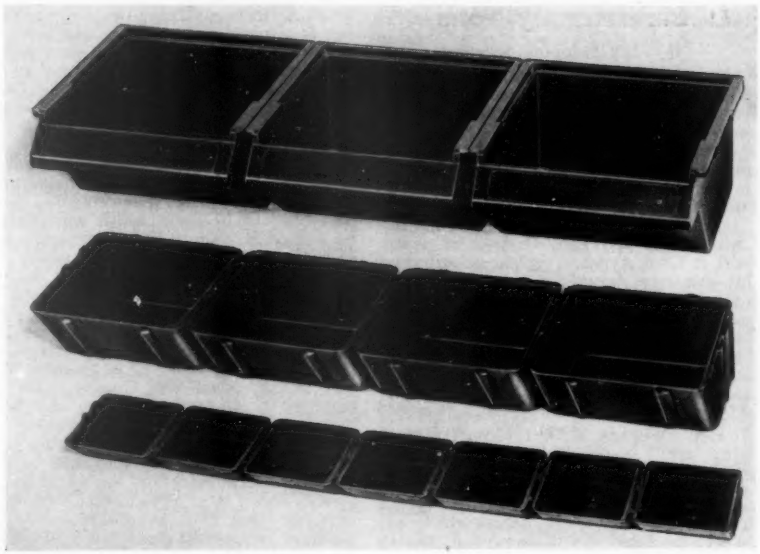
The product has a steel trumpet and casing, an aluminium mouthpiece and a die-cast aluminium handle which contains a trigger-type operating switch. The range in quiet conditions is approximately 400 yd. The 12 V. circuit is supplied by either four batteries of type 1839 or eight of type U11.

Maximum power output is 3½ W. and the average consumption on speech is 120 mA. The length of the item is 15½ in. and the flare is 10½ in. dia. The home-trade price of the Transhailer is £27 and delivery at present is one month. The manufacturer is Pye Telecommunications Limited, Cambridge.

Interlocking Bench Assembly Trays

DESIGNED for use with assembly benches in production workshops, the Kabi Midget range of assembly and storage trays are said to reduce production costs when small, light, metal items, such as screwed parts, and switches, are required for assembly as, for instance, in an electrical fitting shop.

The trays, which will keep small parts classified, yet easily accessible when required on the bench, are interlocking and are moulded in phenolic material in a range of colours which may afford a system of classification. The three basic sizes of tray, illustrated above, are in production; type S.B.100, 7$\frac{11}{16}$ in. long × 5$\frac{3}{4}$ in. wide × 3$\frac{1}{8}$ in. deep; type ST.50, 5 in. long × 4 in. wide × 2 in. deep; and type MST.10, 2$\frac{5}{8}$ in. long × 2$\frac{7}{16}$ in. wide × $\frac{3}{4}$ in. deep. The last two models are also available in curved versions to allow of close work in restricted spaces.



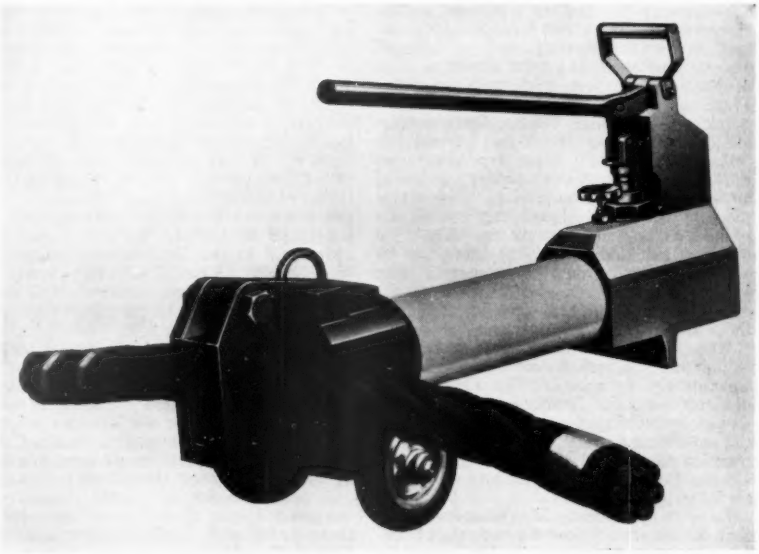
The price of each tray is: type SB.100, 5s. 3d.; type ST.50, 2s.; and type MST.10, 1s. 9d. Delivery can be made from stock. The manufacturer is Precision Components (Barnet) Limited, 13, Byng Road, Barnet, Herts.

Portable Hydraulic Shear

A PORTABLE hydraulic shear to cut steel wire, cables, chain, bars and so on, can be used where it is not desirable or convenient to install a shearing machine. The Carricut can (in the smaller sizes) be carried by one man to the work, and will cut these items quickly, by arm power. The largest size, the B50, illustrated below, which is fitted with a pair of small carrying wheels for ease of handling, will cut wire ropes up to 2 in. dia. and electric cables up to 3¼ in. dia. This model can also be fitted for remote operation with a special foot pump designed by the manufacturer.

The machines, which are covered by provisional patent No. 9036/54, have a hand-lever which actuates a hydraulic pump, exerting pressure on the ram in the centre of the body and thus to the shearing surface. Interchangeable cutting blades are provided for shearing different types of materials. The present range consists of five models, the smallest being the A20 which weighs 53 lb. (gross), the largest weighing 297 lb. (gross). Dimensions of the case for the A20 are 26 in. × 11 in. × 6½ in., and for the B50 are 43 in. × 15 in. × 8½ in.

The prices range from £62 10s. to £157 10s., for models A20 and B50 respectively. Delivery can be made from stock. The manufacturer is the Copelaw Engineering Co. Ltd., Mowden Hall, Darlington, Co. Durham.



Parliamentary Notes

Railway Shipping Services

Before the Transport (Railway Finances) Bill received its third reading in the House of Commons on January 22, there was a short debate on the definition of "British Railways" on Clause 4 for the purpose of financial calculations.

Mr. G. R. Strauss (Vauxhall—Lab.) moved an amendment for the omission of Clause 4 to allow for a clarifying discussion, and after the Minister of Transport & Civil Aviation replied he withdrew his proposed amendment.

Mr. Strauss said the purpose of the Bill was to enable the B.T.C. to tide over the next few years, when it would be in particular financial difficulties because of the modernisation scheme and the large amount of capital, which in the early stages would not fructify, which it would be called upon to spend. The purpose of the Bill was to enable the Commission to capitalise the interest on the capital needed for the modernisation plan and to put in a special account and get a loan to provide for the deficit which was likely to face the Commission during these coming years.

The problem arose in making these calculations of the definition of "British Railways." They were told in Clause 4 that included in the calculations for determining the deficit of the railways during these years would be the collection and delivery by road of goods for the railways; the generation of electricity for the railways, and possibly other things too. The Member for Truro (Mr. G. Wilson—C.) had moved an amendment to the effect that the shipping responsibilities of the Commission should be excluded from the calculations to show what was the deficit of the railways, and the Minister said that that was what he intended to do. Then many of his hon. friends and himself said that that was surely ridiculous. Shipping was part of the British Railways service.

Mr. Harold Watkinson, Minister of Transport & Civil Aviation, welcomed the opportunity to make this matter a little more plain. The B.T.C. always had kept the shipping receipts and traffics separate from its ordinary passenger receipts and goods traffics. The shipping account included receipts and expenditure on craft operated by British Railways used for the conveyance of traffic. Where traffics conveyed and rates and fares included rail and sea traffic throughout, the charges were apportioned, and both activities were credited with their respective portions. There was a split between rail and sea portions on through tickets, for example, to the Continent. Similarly, expenditure was kept separately from expenditure on railways. On train ferries it was apportioned in the same way, except that the cost of track inside the ship was rightly treated as part of cost of the ship. He did not think that he was likely to be asked to determine the matter arising from that under Clause 4 (4). An amendment which attempted to write that into the Bill would be very inconvenient to the B.T.C., because there was this well-established practice and no new complications were likely to arise. The Commission did not want its former accounts to be frozen by writing them into the Bill. He did not think that adding the existing practice to the Bill would do anything to aid the Commission or give any advantage to it.

Later in the debate, Mr. Watkinson said that under the leadership of the Commission, and particularly its Chairman, Sir Brian Robertson, the railways were being run in a much more efficient and business-like way than they had ever been run in the past. It was not sufficient to be satisfied that the structure of the Commission and its organisation were right. He agreed with Members on both sides of the House that that would not have put the railways right. There were the arrears of modernisation to be made up—a major task; there were immense sums of money to be spent which would show no immediate gain to the Commission, and there was the awkward fact, which the House had refused often to face, that on the goods side particularly the limit of charges had been reached in many categories, and that if they were put up still further they would merely carry less freight. If anyone now thought that was wrong, proof was coming from the complaints raised by hauliers and businesses who had, at least temporarily, to transfer their traffics to the railways, and found that by so doing they had to pay a great deal more. "In the Government view," added Mr. Watkinson, "we must face the fact that, at the moment, the question of charges rests not upon what the Commission or what I, as the responsible Minister, might want to do, but on what the customers are prepared to pay. That is a fact which I hope the unions and managements in the railway industry will bear in mind, because it is one which no one can get over.

Staff & Labour Matters

Engineers' Salaries and Conditions

The result of the first of a series of meetings between senior officers of the B.T.C. and representatives of the Engineers' Guild held last autumn have been announced by the Guild.

The matters raised by the Guild on this occasion dealt with the following points:

(1) The substantial number of short salary ranges—varying from £38 to £100—applicable to the appointments through which a professional engineer must advance during the first part of his career in the B.T.C., and their bad effect on the career prospects for professional engineering staff. To meet this difficulty the Guild proposed the substitution of a single range for engineering appointments at this level, with fixed annual increments, commencing at £770 and continuing to at least £1,065.

(2) The desirability of introducing a professional qualification bar, in the public interest, as being the only way to ensure a steady increase in the standards of qualification. It was proposed that the bonus of £75 at present paid to those in professional and technical Group "A" possessing such qualifications, should be continued throughout the new range and ultimately to the level at which the bar took effect. The Guild representatives emphasised the encouragement which these steps would afford to persons to become fully qualified.

(3) The failure to apply annual increments to the salary ranges for out of category staff, within the limits where such salaries are negotiated. Examples were given of cases where the existing practice had given rise to apparent anomalies, and it was proposed that annual increments of appropriate amount should be introduced.

It was agreed that consideration would be given to the Guild views on each of these points and it was stated that a professional qualification bar was, in practice, already applied to a considerable extent by the Commission.

The Guild has announced its intention to seek further meetings from time to time, as occasion requires.

Engineering Wages

The Engineering & Allied Employers' National Federation has agreed to meet the engineering unions in London on February 12 to hear their further representations on the claim for a 10 per cent wage increase for engineering workers. In previous talks the claim has been rejected. The unions will have a similar meeting with the Shipbuilding Employers' Federation on the following day.

Contracts and Tenders

The British Transport Commission has placed a contract with W. T. Henley's Telegraph Works, to the value of about £750,000, for the supply, jointing, and supervision of installation of 90 route miles of 33-kV. three-core oil-filled cable and pilot supervisory cable for the British Railways Kent coast electrification scheme.

It is reported that India has placed a $22·4 million order for 100 diesel locomotives with Alco Products, Incorporated. Shipment of 20 is expected in June.

It is reported from Bombay that India is to receive 2,000 railway wagons, under the Colombo Plan, from Australia.

The Commonwealth Engineering Co. Ltd., Granville, New South Wales, Australia, has contracted to design and build to the order of the Malayan Railway six Budd-type diesel railcars in stainless steel. Complete delivery will be given within 17 months. The cars will be 60 ft. long on metre gauge and power units will be fitted with 230-h.p. Rolls Royce inclined engines driving through twin disc hydraulic torque convertors. Braking is Westinghouse pneumatic, and electrical fittings will be supplied by J. Stone & Company. Accommodation will be second and third class passenger compartments, with rotating and reclining seats in the second class and walk-over type in the third. Lighting is fluorescent, and iced drinking water will be installed. The cars can be operated in either direction and are controlled from one end. They will operate in multiples up to 12.

The British Transport Commission (South Wales Docks) has placed a contract with Cowans, Sheldon & Co. Ltd., for the supply and installation of 12 three-ton electric capstans at Newport Docks.

Beckett, Laycock & Watkinson Limited, announce that their Beclawat weatherproof full-drop windows are to be fitted to three suburban carriages being built by the Birmingham Railway Carriage & Wagon Co. Ltd. for the South African Railways & Harbours.

Rawlings Manufacturing Co. Ltd. has received an order for 2,464 of its balanced windows in their latest form, to be incorporated in 88 coaches being built by the Gloucester Railway Carriage & Wagon Co. Ltd. for Rhodesia Railways.

British Railways, Eastern Region, have placed the following contracts:—

Cleveland Bridge & Engineering Co. Ltd., P.O. Box No. 27, Darlington: renewal of flooring to underline bridge

No. 332 at 156 m. 44½ ch. between Doncaster and Arksey

The London Graving Dock Co. Ltd., West India Graving Dock, Prestons Road, London, E.14: annual survey, drydocking and overhaul to s.s. *Mimie*

Arundel (Contractors) Limited, 70, Harris Street, Bradford: cleaning and painting at Sheffield (Wicker) goods depot

Kirk & Kirk Limited, Atlas Works, Putney, London, S.W.15: drainage work in connection with girders supporting back wall of hotel (platforms 9 & 10) at Liverpool Street Station

Wellerman Bros. Ltd., Dun Street, Sheffield, 3: reconstruction of superstructure of Ipswich Road overbridge No. 1002 and raising of road approaches, between Colchester North and Hythe stations

Yeomans & Partners Limited, 42-44, Upper Berkeley Street, London, W.1: modernisation of waiting rooms at Liverpool Street Station

R. Ridd & Son (Contractors) Ltd., 153, Billet Lane, Hornchurch, Essex: cleaning and painting of station buildings, goods yards, goods sheds, signals, signalboxes, and point rodding, New Southgate, Oakleigh Park, and New Barnet stations.

British Railways, Southern Region, have placed the following contracts:—

Metropolitan Construction Co. Ltd., London, E.C.4: resurfacing, carriage shed, Slade Green

Mears Bros. (Contractors) Ltd., London, S.E.26: reconstruction of dolphin, Deptford Wharf; railway quay, Newhaven Harbour, and Romsey Bridge

L. & W. Whitehead Limited, London, S.W.9: new platform roofing, waiting room and station renovations, West Croydon Station

Deeds (Builders) Limited, Hounslow: renovations, inspection shed and workshop, Wimbledon Park

G. Bainbridge & Son Ltd., Eastbourne: new signalbox, Groombridge

R. Corben & Son Ltd., Maidstone: new accommodation, foundations and drainage works, motive power depot, and chief civil engineer's depot, Ashford

Taylor Woodrow Construction Limited, Southall: new inspection shed, berthing facilities and staff accommodation, Eastleigh, Fratton, and Southampton Central

John Mowlem & Co. Ltd., London, S.W.1: alteration and extension of platforms, Cannon Street Station.

British Railways, North Eastern Region, have placed the following contracts:—

John Pickles & Son (Engineers) Ltd., Hebden Bridge: one chisel mortising and boring machine, wagon works, York

G. C. Hadden & Hillman Limited, Newcastle: provision of cover to staircases, West Monkseaton.

The Director General of the Indian Store Department invites tenders for the supply of tyres (C & W) 2 ft. 4½ in. on tread (MG) to rolled size. See Official Notices on page 176.

The Special Register Information Service, Export Services Branch, Board of Trade, reports a call from the International Co-operation Administration (I.C.A.) Procurement for India, for an all-metal refrigerator van as follows:—

1 broad gauge all-metal refrigerator van on 68-ft. I.R.S. underframes, required for transport of chilled fish, fully furnished and finished in all respects, ready for service on trains run at 60 m.p.h.

The project implementation order No. is 86-18-005-6-50332 (Inv. No. B-791). The issuing authority and address to which bids should be sent is the Government of India, India Supply Mission, 2536, Massachusetts Avenue, N.W., Washington 8, D.C. This purchase will be financed by the International Co-operation Administration (I.C.A.), the agency through which the United States Government gives economic and technical assistance to under-developed countries. Full details of I.C.A.'s methods of operation are contained in Special Register circular GEN/2488 of January 11, 1956. The closing date is February 26, 1957.

Copies of specifications and other documents relating to calls for tender under I.C.A. aid can generally be obtained from the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3. A copy of the specifications and conditions applying to this particular call for tenders is available for loan on application to the Branch (Lacon House, Theobalds Road, W.C.1). Photo-copy sets of the documents can be obtained at a cost of 30s. from the Branch. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements. The reference E.S.B. 2252/57/ICA. should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from South Africa for automatic couplers and spares as follows:—

4,450 couplers, automatic, bottom operated, type "S" 8 in. × 6 in. shank
34,100 knuckles
8,300 levers
16,550 lifters
13,700 locks

The issuing authority is the Stores Department, South African Railways. Bids in sealed envelopes, endorsed "Tender No. H.6382 for Automatic Couplers and Spares," should be addressed to The Chairman of the Tender Board, South African Railways, P.O. Box 7784, Johannesburg. The closing date is March 1, 1957. A copy of the tender documents is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). A photo-copy set can be purchased from the Branch for 5s. Cheques and postal orders should be made payable to the Principal Accountant, Board of Trade. Firms wishing to collect photo-copy sets of tender documents are advised to notify the Branch in advance of their requirements.

The attention of firms is drawn to the fact that because of the present import restrictions the South African Import Control will not issue an import permit if there is any possibility of obtaining the goods required locally, either from local manufacturers or from overseas manufacturers ex locally held stocks. Where invitations to tender are extended overseas the issue of an import permit will be considered but will not automatically be granted. If an overseas firm is successful, the import permit will be issued, but if a local offer is made, it can be accepted without committing the Administration to the issue of replacement permits. The reference ESB/2196/57 should be quoted in any correspondence with the Branch.

The Special Register Information Service, Export Services Branch, Board of Trade, has received a call from India for elements for boiler renewals as follows:—

superheater elements for HS/6 boiler renewal

superheater elements for DS/7, DS/4 boiler renewal

superheater elements, marine and loco type, complete with supports, bands, clamps, and clamp washers

The issuing authority is the Director-General of Supplies & Disposals. The tender No. is P/SW2/19597-G/I. Bids should be sent to the Director-General of Supplies & Disposals, Shahjahan Road, New Delhi. The closing date is February 26, 1957. A set of tender documents, including drawings, is available for loan to United Kingdom firms on application to the Branch (Lacon House, Theobalds Road, W.C.1). The attention of United Kingdom firms is drawn to a booklet issued by the Government of India entitled "Conditions of Contract Governing Department of Supply Contracts," a copy of which is available for inspection at the Branch. The reference ESB/2963/57 should be quoted in any correspondence with the Branch.

The Director-General of Supplies and Disposals, New Delhi, invites tenders for the supply of tilting trollies as follows:—

12 tilting trollies (double side steel tipping wagons). The bodies of these tipping wagons should be made of at least ¼ in. of mild steel plate with tops reinforced by roll bar or by steel angle; frames of chancel steel, complete with buffers and draw gears; and wheels of cast steel disc and/or spoke pattern. Roller bearings to be fitted. The wagon specification is as follows:—capacity 27 cu. ft., gauge 24 in., body height 28 in., length 49 in., width 60 in., height above rail level 47 in., length over buffer 74 in., axle diameter 1¾ in., wheel diameter over tread 12 in., wheel base 22 in., approx. weight 770 lb. Similar to the wagon in D.G.S. & D. illustration No. 13238, for general purpose use.

Tendering firms are to submit details of their offers with drawings. Separate quotations may be given for tested and untested steel used in manufacture. Delivery is required as soon as possible. Tenderers should give the earliest monthly schedule of deliveries that they guarantee to adhere, showing a definite date from which deliveries will be commenced. The address to which tenders should be sent is the Director General, Supplies & Disposals (Section SRI), Shahjahan Road, New Delhi, quoting reference No. P/SRI/18706-G/IV. The closing date is February 21, 1957.

Forms of tender are only available for purchase in India from: Deputy Director General (Supplies), Directorate General of Supplies & Disposals, New Delhi; Director of Supplies & Disposals, Bombay or Calcutta; Deputy Director of Supplies & Disposals, Madras. If the date for the receipt of tenders does not allow sufficient time for tenderers to obtain tender forms from India, they may submit their quotation to India in their own letter form or by telegram provided always that all essential particulars are given and further provided they simultaneously apply for the tender forms and return them duly completed as soon as possible on the basis of

advance quotations already submitted. A copy of the tender form can be examined at the India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, on application to the "CDN". Branch quoting reference No. S2786/56/BN/Rly. and the Drawing can be seen at the office of Hodges Bennett & Company, 59/60, Petty France, Westminster, London, S.W.1, from whom copies may be obtained, if required, at a fixed price per sheet.

Notes and News

Assistant Engineer (Mechanical) Required.—An assistant engineer (mechanical) is required for the London office of the Crown Agents for Overseas Governments & Administrations. See Official Notices on page 176.

Vacancy for Chief Purchasing Officer.—Applications are invited for the appointment of a chief purchasing officer at the London headquarters of the British Electric Traction organisation. See Official Notices on page 176.

Great Northern Railway Board: Production Engineer Required.—The Board requires the services of a qualified production engineer in its Dundalk Works, where locomotives, railcars, carriages, wagons, omnibuses and motor lorries are constructed and overhauled. See Official Notices on page 176.

R.O.D. Officers' Dinner.—The annual dinner of the R.O.D. Officers will be held at the Transportation Club, 44, Wilton Crescent, S.W.1, on Friday, March 22. Colonel Sir Michael Barrington-Ward will be in the Chair.

Presentation to Mr. R. H. Hacker.—A wireless set, a leather travelling case, and books were presented recently, on his retirement, to Mr. R. H. Hacker, formerly Chief Officer (Continental), British Railways Central Staff, British Transport Commission, at a gathering at Commission headquarters. From left to right in the accompanying illustration are shown Messrs. H. A. Short, General Manager, North Eastern Region; J. L. Harrington, Chief Shipping & International Services Officer, B.T.C.; J. C. L. Train, Member, B.T.C., and Vice-President of the International Union of Railways, who made the presentation; R. H. Hacker; Sir John Elliot, Chairman, London Transport; and Mr. David Blee, General Manager, London Midland Region.

Railway Traffic Interrupted by Air Crash.—The wreck of the jet fighter aircraft which, after flying under Clifton suspension bridge, crashed in the Avon gorge last Sunday, caused a slight landslide which threatened the single line of the Bristol to Portishead branch of the Western Region, which runs through the gorge, on the left bank. Traffic was suspended for a short period.

Public Transport Association Conference.—The Eastbourne Conference of the Public Transport Association is to be held on April 30 and May 1 and 2. The programme includes an informal reception by the Chairman and Vice-Chairman of the Council on April 30, and an official welcome by the Mayor of Eastbourne on May 1, to be followed by the annual general meeting of the Association. A paper on advertising and selling road passenger transport will be read by Mr. J. H. Richardson, Traffic Manager of the Northern General Transport Co. Ltd. on May 1, and, the next day, Mr. D. E. Eyres, Chief Accountant of the Sheffield Transport Department, will read a paper on stores control and accounting. Both papers will be followed by discussions.

Materials Handling Equipment Limited Leamington Office.—Materials Handling Equipment (Great Britain) Limited, of Chesterfield Gardens, London, W.1, sole concessionaires for the United Kingdom and British Commonwealth for Irion side-operating fork lift carriers of 3 tons and 5 tons capacity, announces that because of the increasing demand for these carriers it has opened branch offices at 96, Warwick Street, Leamington Spa, Warwickshire, tel. 2145. This has been done for the greater convenience of customers and prospective customers in the Midlands and North. This, the Midlands Division of the company, is under the management of Mr. Norman Devonport.

Newhaven-Dieppe Service to be Resumed.—The Newhaven-Dieppe steamer service which, apart from the Christmas holiday period, has been suspended since November because of the oil shortage, is to be resumed on April 5. The Newhaven-Dieppe night service is to be resumed on July 13.

Mobilisation of Argentine Railwaymen.—The provisional Government of Argentina decreed on January 30 the mobilisation of railwaymen concerned in a "go-slow" strike on the General Roca Railway. The strike was caused by the dismissal of a locomotive driver. Certain laws normally operating in time of war have also been invoked. The General Roca Railway was known formerly as the Buenos Ayres Great Southern Railway.

Cocktail Party at India House.—A cocktail party was held on February 1, at India House, Aldwych, W.C.2, to bid farewell to Mr. R. G. da Costa, Railway Adviser to the High Commissioner for India, and to greet his successor, Mr. L. T. Madnani, formerly Joint Director, Mechanical Engineering, Indian Railway Board, New Delhi. Mr. da Costa returns to India in March to take up another appointment.

Increased Fares and Charges between Great Britain and Ireland.—Because of increased fuel and other operating costs, British Railways and the independent steamship companies operating between Great Britain and Ireland have found it necessary, as from February 1, to increase their charges by way of surcharges for the conveyance by sea of passengers, merchandise, and livestock. The surcharge for passengers is 9d. per single sea journey (1s. 6d. per return journey); details of the additional surcharges for merchandise or livestock are available at railway stations and at the offices of the steamship companies concerned.

Scottish Region Christmas Tree Collections.—A total of £1,735 was collected for hospitals and railway and other charities at the Christmas Tree displays featured by the Scottish Region of British Railways during the 1956 festive season at stations in Glasgow, Edinburgh, Dundee, and Aberdeen. In addition to money contributions, 5,400 gifts of toys, games, books, and so on, were received, and these were distributed to local hospitals and institutions. The collection figures in each city were as follows: Aberdeen, £301 and 2 635 gifts; Dundee (Tay Bridge & West stations), £185 and 1,110 gifts; Edinburgh (Waverley & Princes Street stations), £492 and 1,283 gifts; and Glasgow (Central, St. Enoch and Queen Street stations), £758 and 388 gifts.

Symposium on Aluminium in Electrical Engineering.—A Symposium on Aluminium in Electrical Engineering has been arranged by the Aluminium Development Association for May 16-17, 1957, at the Institution of Electrical Engineers, Savoy Place, London, W.C.2, by courtesy of the Council of the Institution. Twelve papers by electrical engineers with experience in using aluminium will be presented in the course of three sessions under the titles: "General and Economic Considerations in Using Aluminium in Electrical Engineering," "Aluminium in Transmission and Distribution Lines," and "Aluminium in Electrical Equipment." Papers will be sent in advance, as preprints; to those registering for attendance. At the Symposium, the papers at each session will be introduced by a Rapporteur, so that maximum time will be available for discussion and for replies by the authors. Requests for invitations to attend are open to electrical

Mr. J. C. L. Train making the presentation to Mr. R. H. Hacker on his retirement

engineers and others with qualifications and experience in the electrical industry. Applications should be addressed to the Aluminium Development Association, 33, Grosvenor Street, London, W.1.

Mansion House Association on Transport: Annual Luncheon.—The annual luncheon of the Mansion House Association on Transport will be held at the Trocadero Restaurant, Piccadilly, London, W.1, on March 15, at 12.15 for 12.45 p.m.

Railway Operations in Autumn, 1956.—The figure in the sixth line of the penultimate paragraph of the editorial article on page 128 of our February 1 issue, of the stock of diesel units in the U.S.A. as at December 1, 1956, should read 26,130, and not 216,130.

Lighting of Kings Cross Road Motor Depot.—In the reference on page 140 of last week's issue, to the cold cathode lighting supplied to the road motor depot at Kings Cross, it is regretted that the details of the installation, given in error in the second paragraph, do not apply to the work at this depot, for which the manufacturers, Ionlite Limited, supplied fittings which were specially designed for this particular application. It is hoped to describe in detail in the near future, the lighting installations by Ionlite Limited at York Station and at the Kings Cross road motor depot.

Commonwealth Parliamentary Delegation Visit to E.A.R. & H. Installations at Mombasa.—A Commonwealth Parliamentary delegation, led by Sir Thomas Dugdale, recently visited East African Railways & Harbours port and railway installations at Mombasa. The port tour was conducted by the Chief Ports Manager, Mr. A. H. Earley and the Port Manager, Mr. G. R. Williams. The party toured the lighter quays, dockyard, a mechanised shed, the deep-water quays; saw the construction work on Number 10 berth and the site on which the decking beams for the berth are being cast. From a launch they examined Port Reitz harbourage, the site of the new deep-water quays at Kipevu causeway in the last stages of construction, and at Mbaraki, the site of a projected passenger terminus. The visit to Changamwe was made by Sir Thomas Dugdale and Mr. E. W. Mulley, who were conducted by Mr. I. E. Garfield, District Traffic Superintendent, and the Resident Engineer, Mr. J. Rhodes-Liddie. Delegates were shown the site of the new marshalling yards, the new rail alignment, storage facilities for railway fuel oil, and part of the 16-in. pipeline that will carry the oil from Shimanzi. The visitors also saw the new Changamwe station, platforms, and goods sheds, and inspected railway African housing.

Railway v. Army Boxing Match at Reading.—The Western and Southern Regions of British Railways combined at Reading on January 25 to box against a team from the Southern Command of the Army. Sir Brian Robertson, Chairman, British Transport Commission, presided and among those present were General Sir George Erskine, G.O.C.-in-C., Southern Command; Mr. R. F. Hanks, part-time Member, B.T.C. (also Chairman of Western Area Board), and Mr. W. P. Allen, Manpower Adviser, B.T.C. Guests from the Southern Region included Mr. J. MacNaughton Sidey, Member of the Southern Area Board; Mr. C. P. Hopkins, General Manager; Mr. D. McKenna, Assistant General Manager, and Mr. H. C. Lang, Regional Establishment & Staff Officer. The Western Region was represented by Mr. K. W. C. Grand, General Manager; Mr. H. G. Bowles, Assistant General Manager; Mr. A. C. B. Pickford, Chief Commercial Manager; Mr. R. Burgoyne, Regional Establishment & Staff Officer; Mr. A. W. Woodbridge, Signal Engineer; Mr. C. T. Roberts, Carriage & Wagon Engineer, and Mr. C. J. Rider, Public Relations & Publicity Officer. Mr. J. Ness, General Manager, Scottish Region, was also present. Of 14 bouts, eight were won by the Army, and six by British Railways (three from each Region).

Exhibition of Vacuum Brake Equipment Requirements.—The trade exhibition of British Railways requirements of vacuum brake equipment for completion of the programme of fitting wagons with continuous brakes will be held in the Central Offices, Room 155, Euston Station, N.W.1, on Monday, February 18 (11 a.m. - 4 p.m.), on Tuesday-Friday, February 19-22, inclusive (10 a.m. - 4 p.m. each day), and during the corresponding hours on Monday to Friday inclusive in the following week. For the convenience of firms wishing to attend admission will be by ticket only, obtainable on application to Mr. E. R. Sambridge, Chief Stores Officer's Department, B.T.C., Room 156, Euston Station, London, N.W.1 (Telephone: Euston 1234—extension 8274). The date on which it is desired to attend should be stated, with an alternative.

New Ships for Associated Humber Lines.—With the placing of orders by Associated Humber Lines Limited for six new cargo vessels, the final stage of the modernisation of the line's Humber-Continental shipping services will be reached. The six new ships, with two passenger/cargo ships already under construction for the Hull-Rotterdam service, will replace the older ships now remaining in the fleet, which will then be composed entirely of modern motor vessels. Of the six new vessels, three, of approximately 1,100 tons deadweight each, will be built by James Lamont & Co. Ltd., of Greenock, and three, two of approximately 1,300 tons deadweight, and one refrigerated ship of approximately 1,250 tons deadweight, will be built by A. & J. Inglis Limited, of Glasgow. All six will be engined by Ruston & Hornsby Limited and have a service speed of 12½ knots. The design of the new ships has been prepared by the B.T.C. consultants, Burness, Corlett & Partners Limited, in conjunction with technical officers of Commission headquarters and of Associated Humber Lines Limited. MacGregor hatch covers will be utilised to help in rapid turnround of the ships. Special attention has been given to the conveyance of railway containers, and each vessel will be able to convey up to 30 large covered containers and correspondingly larger numbers of smaller types.

Enfield Cables Limited Sales Organisation.—Enfield Cables Limited announce the following re-arrangement of the firm's sales organisation in Scotland from the beginning of this year. The Glasgow Branch is re-named Scottish Branch and Mr. A. B. MacLean, who remains in charge of the branch, is now known as Manager, Scottish Branch. The Edinburgh Branch now operates as a depot directly under the control of the Manager, Scottish Branch. The Aberdeen Depot is now closed.

Globe to Build Hoists in England.—Globe automotive and heavy duty truck hoists will be available to European, Eastern, and other world markets through manufacturing facilities established by the Globe Hoist Co. Ltd., of Brentford, Middlesex. This has been announced by the export department of the Globe Hoist Company, of Philadelphia. Globe, through its British subsidiary, has just concluded manufacturing arrangements with the Tecalemit Limited, of Plymouth. Hoists made to the distinctive design specifications of the Globe product will use the lift-building facilities of Tecalemit Limited and henceforth will be sold under the Globe brand name. Sale of the British-made product will be directed from the Globe Philadelphia offices.

Presentation of Western Region First Aid Awards

Mr. K. W. C. Grand, General Manager, with, on his right, Mr. R. Burgoyne, Regional Establishment & Staff Officer, and, on his left, Mr. J. A. Martin, Regional Ambulance Secretary, and Dr. C. T. Newham, Medical Officer (*See last week's issue*)

OFFICIAL NOTICES

SERVICE ENGINEER, preferably with sound knowledge of Wilson Gearboxes and Railway operation, required by manufacturers in connection with British Railways' Dieselisation programme. Self-Changing Gears Limited, Lythalls Lane, Coventry. Tel. 89081.

DRAUGHTSMEN, SENIOR and JUNIOR, preferably with railway experience or automative experience, required for Drawing Office situated in London area, N.W.10. Apply in writing, giving age, details of experience and salary required, to General Manager, British United Traction Limited, 14, Hanover Square, London, W.1.

SENIOR TRAFFIC ASSISTANT required by Albright & Wilson Limited, chemical manufacturers, Oldbury, for their Central Traffic Department. Age about 30/35. Experience in transport and/or Shipping essential. Preference will be given to candidate who has attained the status of A.M.Inst.T. or equivalent. Non-contributory pension scheme. Good commencing salary. Apply Staff Officer, Albright & Wilson Limited (Ref. 349), P.O. Box 3, Oldbury, Birmingham.

POWER RECTIFIERS.—A large manufacturing firm in the Midlands requires an ENGINEER to assist in development and design of high power rectifier equipments. The department handles rectifiers of all modern types and for all kinds of applications, offering scope for exceptionally wide experience and interest, with good salary and prospects. Previous rectifier experience not necessary, but a Degree or approximate equivalent and some practical experience are desirable. Very good residential district, with excellent educational facilities of all kinds. Apply with full details to Box 233, *The Railway Gazette*, 33, Tothill Street, London, S.W.1.

GREAT NORTHERN RAILWAY BOARD.—The Board requires the services of a QUALIFIED PRODUCTION ENGINEER in its Dundalk Works where the Undertaking's Locomotives, Rail Cars, Carriages, Wagons, Omnibuses and Motor Lorries are constructed and overhauled. He will be directly responsible for maintaining the production planning and control organisation. He must be capable of preparing production programmes, determining workshops capacities and schedules, labour and materials requirements, the measurement of performance against plan, and the improvement of production methods. The salary will be in the range £985—£1,100 according to the experience of the successful applicant. Applications, giving particulars of age, qualifications and experience, should be sent, marked "Production Engineer," to the Secretary, Great Northern Railway Board, Amiens Street Station, Dublin, on or before 26th February, 1957. P. E. M. Carey, Secretary, Amiens Street Station, Dublin.

THE B.E.T. FEDERATION, LIMITED. Chief Purchasing Officer. Applications are invited for the appointment of CHIEF PURCHASING OFFICER at the London headquarters of The British Electric Traction organisation. The appointment will carry the responsibility for the running and general supervision of the Stores Department of The B.E.T. Federation, Limited, which undertakes the purchasing of a wide range of supplies for some 90 associated companies, many of them engaged in operating buses and coaches in the Provinces. Some 450 buying arrangements are at present in force. Thorough experience of purchasing is essential for this appointment. A salary will be paid appropriate to such experience. A pension fund and endowment scheme are in operation. Applications, which will be treated in strict confidence, should be marked "Private and Confidential" and addressed to The Chairman, The Stores Committee, The B.E.T. Federation, Limited, Stratton House, Piccadilly, London, W.1, to reach him not later than 28th February, 1957.

ASSISTANT ENGINEER (MECHANICAL) required for their London Office by the CROWN AGENTS for Oversea Governments and Administrations for appointment to pensionable establishment on probation for two years. Salary scale £765 × £25—£840 × £30—£990 × £40—£1,190 a year. The £765 minimum is linked to entry at age 25 and is subject to increase at rate of one increment for each year above that age up to 34. Fully qualified officers at least 27 years old may be eligible for special increase of £75 after two years' service. Prospect of promotion. Candidates should have passed qualifying examination A.M.I.Mech.E. or equivalent examination. They should have served apprenticeship or pupilage in the rolling stock department of British Railways or with carriage and wagon builders or a firm specialising in manufacture wharf or railway break-down cranes. They should also have subsequent drawing office experience in design of carriages and wagons, diesel railcars or cranes, together with a sound knowledge modern workshop practice. Duties include preparation of contract specifications, examination and approval of drawings, design calculations, and technical correspondence. Write to the Crown Agents, 4, Millbank, London, S.W.1, State age, name in block letters, full qualifications and experience and quote M2A/40807/RA.

THE Proprietors of Patent No. 660855 for "Railway Car Truck Side Frames," desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

THE Proprietors of Patent No. 660849 "Improvements in or relating to Brake Beams" desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28 Southampton Buildings, Chancery Lane, London, W.C.2.

BOUND VOLUMES.—We can arrange for readers' copies to be bound in full cloth at a charge of 25s. per volume, post free. Send your copies to the SUBSCRIPTION DEPARTMENT, Tothill Press, Limited, 33, Tothill Street, London, S.W.1.

Railway Stock Market

Recent gains in stock markets were followed by a fair amount of profit-taking, but renewed demand developed, and there were further gains on balance both in British Funds and industrial shares. Hopes of a lower Bank rate still helped sentiment, and moreover, expectations of reductions in future expenditure on defence have aroused hopes that the Budget may bring a cut in income tax.

Among foreign rails better demand was in evidence for Antofagasta ordinary stock, which strengthened from 31¼ to 32¼, while the preference stock moved higher at 46½, compared with 45½ a week ago. Buyers were also about for United of Havana second income stock, which firmed up from 7⅞ to 8 with the consolidated stock maintained at 2¼.

Chilean Northern first debentures have been less active and at 43½ were the same as a week ago, and Costa Rica ordinary stock marked around 27 with business at 74½ in the 6½ per cent first debentures. In other directions, Dorada ordinary stock showed business at 51, and Guayaquil & Quito 5 per cent bonds remained at 92.

Elsewhere, Nitrate Rails shares moved up from 20s. to 21s. 3d., but Taltal eased from 12s. to 11s. 6d., Mexican Central "A" bearer debentures remained at 68½, and Brazil Railway bonds at 6 also had the same quotation as a week ago. San Paulo Railway 3s. ordinary shares have been dealt in around 3s. 1½d. International of Central America were quoted at $32½ again and the gold bonds at £172½ were slightly lower than a week ago. Paraguay Central prior stock has changed hands around 14¼.

As was to be expected, Canadian Pacifics again reflected the easier Wall Street trend and were $61¼, compared with $61¼ a week ago after touching $61⅞. Buyers were again in evidence for the 4 per cent preference because of the good yield, and the price rose further from £62 to £64, and the 4 per cent debentures strengthened from £72½ to £72¾. Elsewhere, White Pass shares moved up from $18¼ to $19¼, and Peru Transport "B" shares were slightly under $1¼.

Nyasaland Railways shares held their rise to 10s. 9d. and the 3 per cent debentures were also the same as a week ago.

Among shares of locomotive builders and engineers, main attention centred again on Beyer Peacock because of the good yield, and the price had advanced further to 42s. 9d., which compares with 40s. a week ago. G. D. Peters shares which were, as usual, held firmly, were quoted at 30s. Charles Roberts 5s. shares changed hands around 11s. 6d.xd, and in other directions, activity continued in Westinghouse Brake, which were well maintained as compared with a week ago at 79s. 6d. but did not keep best levels. At Glasgow, Hurst Nelson (36s. 6d.) were quite well maintained, while activity suddenly developed in North British Locomotive shares, which have risen on the week from 10s. 9d. to 14s. 3d. Birmingham Carriage advanced from 15s. 10½d. to 18s. 1½d. Wagon Repairs 5s. shares have been firm at 12s. 3d. with Gloucester Wagon 10s. shares maintaining the higher level of 13s. reached last week.

Electrical equipment shares encountered further profit-taking which brought Associated Electrical down from 68s. to 66s. 9d. while General Electric came back to 54s. 9d. and English Electric to 51s. 9d. Henley's Telegraph 10s. shares have been firm on the news of the company's important contract. Elsewhere, Vickers came back to 42s. 3d. with the prevailing trend in markets earlier in the week, but Cammell Laird 5s. shares had a firmer appearance at 12s. 3d. and Ruston & Hornsby at 33s. have held their good advance. T. W. Ward kept steady at 68s., Tube Investments eased to 61s.

Forthcoming Meetings

Open currently and until further notice.—British Transport Commission: Historical Exhibition "Transport Treasures" in Shareholders' Meeting Room, Euston Station, from 10 a.m. to 6 p.m. on weekdays, and 2 to 6 p.m. on Sundays. Admission 6d.

February 12 (*Tue.*).—Institute of Transport, Yorkshire Section, at the Great Northern Hotel, Wellington Street, Leeds, 1, at 6.30 p.m. Paper on "Port operations," by Mr. S. A. Finnis, Chief Docks Manager, B.T.C., Southampton.

February 12 (*Tue.*).—Institute of Transport, Glasgow Graduate & Student Society, at the offices of British Road Services, Glasgow, at 6 p.m. Paper on "The place of diesel railcars in Great Britain," by Mr. D. M. Howes, Assistant to Chief Operating Superintendent, British Railways, Scottish Region

February 12 (*Tue.*).—Institute of Transport, Scottish Section, at the North British Hotel, Edinburgh, at 5.30 for 6 p.m. Paper on "Post-war trends in international tourism," by Mr. G. W. Adam, Manager, Thos. Cook & Son, Glasgow.

February 13 (*Wed.*).—Institute of Transport, Southern Section, at the Harbour Board Offices, Southampton, at 5.45 p.m. Paper on "Railway electrification," by Mr. J. W. Dedman.

February 13 (*Wed.*).—Railway Students' Association, at the London School of Economics & Political Science, Houghton Street, Aldwych, W.C.2, at 6.15 p.m. Paper on "Modernisation on the railways as particularly affecting the operating department," by Mr. L. W. Cox, Chief Operating Superintendent, London Midland Region. Mr. J. W. Watkins in the chair.

February 15 (*Fri.*).—Institute of Transport, Tees-side Section, at the Cleveland Scientific & Technical Institution, Middlesbrough, at 7 p.m. Debate: "That competition in transport is essential for efficiency."

February 18 (*Mon.*).—Permanent Way Institution, London Section, at the Headquarters of the British Transport Commission, 222, Marylebone Road, London, N.W.1, at 6.30 p.m. Presidential Address: "Planning the railways of the future," illustrated by lantern slides.

February 22 (*Fri.*).—Annual Re-union Dinner—Officers of the Royal Engineers Army Emergency Reserve (Transportation), at the Cafe Royal, Regent Street, London, W.1.